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Would a Free Banking System Target NGDP Growth?

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Abstract

Building on Selgin (1994), we develop a simple model of free banking and study the system's effects on familiar macroeconomic variables. We show a free banking system does in fact stabilize nominal income in response to aggregate demand shocks. However, in the event of an aggregate supply shock, a free banking system instead stabilizes inflation, engaging in mildly procyclical behavior. We conclude by calling for a broader study of nominal income targeting and free banking in the tradition of 'monetary constitutionalism' (Yeager 1962; White et al. 2014) to ascertain whether this result, while almost certainly not the best of all possible worlds, is in fact the best of all probable worlds.

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1. Introduction

The aftermath of the 2008 financial crisis has seen economists propose a plethora of suggestions for financial and monetary reform. Of the proposed reforms to the conduct of monetary policy, perhaps the most notable is the recommendation that monetary authorities adopt a nominal gross domestic product (NGDP) target. As argued most prominently by Scott Sumner (1989, 1995, 2011, 2012), NGDP targeting attempts to stabilize aggregate demand by offsetting changes in money demand with appropriate changes to the money supply. Prior to the financial crisis, several authors offered similar views. Examples include Bean (1983), Hall (1984), McCallum (1985, 1999), Hall and Mankiw (1994), Cecchetti (1995), and McCallum and Nelson (1998). And since the crisis NGDP targeting has been recommended in cautiously optimistic fashion by prominent macroeconomists such as Christina Romer (2011) and Michael Wooldford (2012). Understandably, its proponents have focused on reforming the Federal Reserve's operating framework to best implement an NGDP targeting regime.

Intriguingly, another literature suggests that an NGDP target may result as the unintended consequence of a free and unregulated banking system. As argued most prominently by White (1989, 1995), Selgin (1988, 1994), and Selgin and White (1994), and as explored more recently by Salter (2013, 2014), *free banking systems*—i.e., banking systems characterized by no legal restrictions on banking other than those associated with ordinary property, contract, and tort law—stabilize NGDP via the profit-maximizing behavior of individual banks.

One of the most distinctive features of free banking systems is that any bank can issue its own banknotes, presumably redeemable in whatever is the economy's base (or outside) money. These banknotes circulate throughout the economy and, along with other bank liabilities, function as the day-to-day media of exchange. Unlike an economy where central bank notes

circulate as currency, under a free banking system all of the media of exchange are privately issued. The media of exchange will be constituted by bank liabilities, including banknotes as well as demand deposits (M1 money) and certain types of savings deposits (M2 money). As in the US economy today, different types of bank liabilities will be more or less monetary in character and function. A key difference, however, is that the base money is not generally used in transactions and need not be provided by the government or its central bank.

Under the type of banking system described above, banks naturally act to offset changes in money demand in such a way that aggregate demand is stabilized. When the public's demand to hold money increases, banks experience fewer adverse clearings, i.e. individuals and other banks redeeming their liabilities for outside money. With less frequent adverse clearings, banks face less risk in expanding their balance sheets and using their liabilities to finance the purchase of income-generating assets. The expansions of bank balance sheet increases the (broad) money supply. The result looks remarkably similar to an NGDP targeting regime: increases in bank-issued money offset increases in money demand. Conversely, if the public becomes less willing to hold bank liabilities, banks experience more frequent adverse clearings and rationally respond by increasing their precautionary reserve balances by selling assets. The result in this case is a reduction in the supply of money to offset reductions in money demand.

In this paper we subject the claim that free banking results in NGDP targeting to more rigorous scrutiny than it has previously received. The only formal models used to study this question are those developed by Selgin (1994) and Sechrest (2008). Of the two, Selgin's is the more parsimonious, as well as more easily generalizable, so we use it as the foundation for our own analysis. In particular, we shed light on the factors that result in a free banking system actually mimicking the results of a purposefully-implemented NGDP targeting regime. In

Section 2 we sketch the basic model, which shows the parameters driving the equilibrium values of the money supply and the price level, and hence aggregate demand, in a free banking system. In Section 3 we conduct comparative statics to see how the model responds to both aggregate demand and aggregate supply shocks. In Section 4 we conclude by discussing the implications of our findings, as well as possible important extensions.

2. A Free Banking System Model

We begin with the simple model of a free banking system that is provided by Selgin (1994). The model provides a framework for asking: how would a free banking system behave in response to shocks; would it operate in such a fashion that it “targets” a particular path for nominal income? The answers will involve an analysis of how banks expand or contract their balance sheets in response to shocks, and this will in turn depend on whether or not the shocks are to aggregate demand (velocity; money demand) or aggregate supply.

Consider a closed economy with a competitive free banking system. There are a large number, b , of price-taking banks. There are discrete planning periods at the beginning of which each bank has an equal share of the market, $1/b$. These banks issue liabilities (notes and deposits) that are redeemable at par in a base money. The base money may consist of some commodity (e.g., gold) or the liabilities of a central bank. (For simplicity we will assume that the accepted unit of account is a dollar.) A clearing house exists through which banks redeem one another's liabilities in the base money. The stock of base money constitutes the reserves of the banking system. The ratio of monetary base to bank liabilities (or the *reserve ratio*) is determined endogenously via competition amongst banks. Banks' liabilities (notes and deposits) function as the media of exchange.

Define the stock of base money as R dollars and the stock of bank liabilities (broad money) as M dollars. The reserve ratio is $R/M = \rho$. An implication of this is that in a free banking system the conventional money multiplier is not a function of the public's preferred ratio of currency to bank deposits (c). In its conventional textbook formulation, that multiplier would be $(1 + c)/(\rho + c)$. In the free banking system modeled here, however, banks provide all of the exchange media, including the currency in the form of bank notes. Therefore the public's currency-to-deposit ratio is irrelevant; the entire stock of base money is equivalent to reserves and the money multiplier is $(1/\rho)$. This is because bank reserves are unaffected by variations in money demand (velocity). Rather, changes in money demand are accounted for by changes in the issue of broader money.

During a discrete planning period, t , there are N payments and clearing transactions that are made. For simplicity, Selgin (1994, p. 141) assumes that clearings are governed by the type random process described by Edgeworth. There are b^2 possible clearing transactions of equal real values, one for each possible transfer from combinations of a bank i to a bank j (including the b cases where $i = j$). During a planning period, there will be N random draws, with replacement, from the possible clearing transactions. Banks will be concerned with the possibility of net reserve losses (i.e., negative transactions) that will be settled in base money at the end of each planning period. A representative bank's reserve losses during a planning period will be a random variable, symmetrically distributed around a zero mean. Assume that P is the nominal value of a clearing transaction; then the standard deviation of net reserve losses for the representative bank is,

$$(2.1) \quad \sigma = (P/b)\sqrt{2N(b-1)}.$$

Even though net reserve losses in the model economy always have expected value of zero for the representative bank, the standard deviation of net losses varies in proportion to the square root of total transactions and also in strict proportion to the nominal value of each transaction during the planning period.

We will assume that a representative bank's demand for reserves is proportional to (2.1), such that total reserve demand is,

$$(2.2) \quad R = \sigma b q,$$

where q is a parameter that indicates the representative bank's aversion to defaulting on end-of-period settlement. (The representative bank's reserve demand is $1/b^{\text{th}}$ of (2.2).) This assumption reflects a well-known implication of precautionary reserve demand (e.g, Orr and Mellon (1961), Baltensperger (1980) and Laidler (1991)). In a free banking system similar to the one elaborated on here, Selgin (2001) formally models a representative bank's problem of minimizing the sum of the opportunity cost (of not loaning out) reserves and the cost of maintaining non-negative reserves (e.g., through overnight borrowing in the face of unexpectedly large net losses). The result is a reserve demand function proportional to the standard deviation of net reserve losses, as in (2.2).¹

During a planning period, the nominal value of transactions through the clearing house is PN . Since all transactions are assumed to be carried out with units of broad money (M – bank liabilities) PN is the total nominal value of spending in the economy. Assume that real final goods transactions, Y , are related to total transactions, N , by a parameter, $0 < \phi < 1$, such that,

$$(2.3) \quad Y = \phi N.$$

¹ A reserve demand function such as (2.2) underlies Selgin's (2001) argument that in-concert overexpansion of bank liabilities is unlikely to occur in a free banking system as long as (i) there is routine interbank settlement and (ii) banks do not collude to refrain from redeeming one another's liabilities.

Then (2.3) provides the link between (2.1) and (2.2) from the free banking system and the macroeconomic equation of exchange,

$$(2.4) \quad MV = PY,$$

where V is the rate of income velocity and Y is, in addition to real final goods transactions, real income and output of the economy. Since all transactions occur using bank liabilities, the price level during a given period, P , corresponds to the nominal value of a clearing transaction.

Based on (2.1) – (2.4), we can solve for equilibrium values of the price level and the broad money stock:

$$(2.5) \quad P = \frac{R}{qY} \left[\frac{\phi Y}{2(b-1)} \right]^{\frac{1}{2}};$$

$$(2.6) \quad M = \frac{R}{qV} \left[\frac{\phi Y}{2(b-1)} \right]^{\frac{1}{2}}$$

These equilibrium relationships provide the basis for our analysis of how the broad money supply in a free banking system would respond to macroeconomic shocks, and whether or not that response would, *de facto*, resemble a policy of NGDP growth rate targeting.

Of note, in relation the macroeconomic equation of exchange, (2.4), one typically conceives of shocks to money demand as exogenous changes in velocity. However, the model presented here also incorporates endogenous changes in money demand. Based on (2.3) and the assumption that all transactions are carried out with broad (bank-issued) money, (2.6) also embodies the free banking system's response to endogenous changes in the *transaction demand for money*. Holding velocity and the price level constant, when real production increases or decreases so does the number of transactions, $N = (1/\phi)Y$. The supply of broad money issued by banks increases or decreases to accommodate the variation in number of transactions that are

consistent with the increase or decrease in real production. Recognizing the role of transaction money demand important. Whether or not the free banking system effectively targets NGDP will depend on whether it is responding to aggregate demand shocks (i.e., exogenous variation in V) or aggregate supply shocks (i.e., exogenous variation in Y leading to variation in transaction demand).

3. Response of the Model to Shocks

To elaborate and build upon Selgin's insight, note that we can take natural logs of (2.5) and (2.6) and then convert them into growth rates:

$$(3.1) \quad p = r - 0.5y;$$

$$(3.2) \quad m = r - v + 0.5y.$$

Aggregate demand ($m + v$) appears explicitly in (3.2) and we will consider shocks to the velocity (money demand) component. We will also assume a simple aggregate supply function to complete the macroeconomic system:

$$(3.3) \quad y = y^* + \gamma p,$$

where y^* is the potential growth rate of the economy and $\gamma \geq 0$ indicates the extent of short-run price stickiness. When $\gamma = 0$ (3.3) becomes a vertical long-run aggregate supply curve. We will consider shocks to the y^* component.

3.1. Aggregate Demand Shocks

Consider a shock to v , say a decrease (i.e., a negative aggregate demand shock).

Assuming constant rates of output and base money growth, an inspection of (3.2) demonstrates that the aggregate demand shock will be offset, one for one, by an opposite change in broad

money growth. As Selgin (1994, p. 1453) observes, “the stock of money adjusts in inverse proportion to changes in velocity” while the “price level, on the other hand, [is] invariant to changes in velocity[.]” Intuitively, when v falls so does the frequency of adverse clearings experienced by banks. Banks respond by expanding their balance sheets, more confident that they issue additional liabilities while still making good on them; the growth of broad money, m , increases.

If banks respond to the change in v by an equal and opposite change in m then the free banking system serves to stabilize NGDP growth ($p + y$) in response to aggregate demand shocks. Banks expand or contract their liability issues such that they offset decreases or increases in velocity. This stabilization of aggregate demand is illustrated in **figure 1**. Of course, since it is aggregate demand that is being stabilized, the free banking system stabilizes NGDP growth regardless of whether prices are assumed to be relatively sticky or flexible.

Inspection of (3.2) reveals that, in response to a decrease in v , the alternative to an offsetting increase in m is for doubly large increase in y . Consistent with (3.1), this would also have to entail a decrease in p equal to that of v . Selgin (1994, p. 1453) dismisses this possibility – “output being assumed constant” – without comment. However, he surely did so because the possibility is blatantly inconsistent with a negative aggregate demand shock. First, output growth would *increase*, more than proportionately to the aggregate demand shock. Second, output growth and inflation would move in opposite directions.

3.2. *Aggregate Supply Shocks*

While a free banking system of the type modeled in section 2 above offsets shocks to aggregate demand, and therefore stabilizes NGDP growth, the result is quite different when

considering aggregate supply shocks. Here we demonstrate that such a free banking system *destabilizes* aggregate demand in response to an aggregate supply shock. An aggregate supply shock occurs banks will match it by half with a like change in broad money (aggregate demand) growth. All else equal this destabilizes NGDP growth, resulting in variation greater than would be the case given the aggregate supply shock alone. Because the aggregate supply shock and the aggregate demand response affect price level growth in opposite directions, the free banking system systematically works to stabilize the inflation (rather than NGDP growth) rate.

Consider a shock to y^* in (3.3), say a positive aggregate supply shock of 1%. Combining (3.1) with (3.3) and then also (3.2) with (3.1) we can arrive at the following two relationships:

$$(3.4) \quad p = \left(\frac{1}{1 + 0.5\gamma} \right) r - \left(\frac{0.5}{1 + 0.5\gamma} \right) y^* ;$$

$$(3.5) \quad m = r - v + 0.5y^* + 0.5\gamma p.$$

According to (3.4), for $\Delta y^* = 1\%$ the corresponding change in inflation is $\Delta p = -0.5/(1 + 0.5\gamma)\%$. And both of these changes feed into (3.5) such that $\Delta m = 0.5/(1 + 0.5\gamma)\%$. The free banking system responds to the positive aggregate supply shock by expanding broad money growth to offset, one for one, the fall in inflation.

Note that despite the fact that $\Delta y^* = 1\%$, the change in the output growth rate may be less because p has fallen. Plugging $\Delta y^* = 1\%$ and $\Delta p = -0.5/(1 + 0.5\gamma)\%$ in the aggregate supply function, (3.3), we find that $\Delta y = 1/(1 + 0.5\gamma)\%$. In other words, the increase in the output growth rate may be less than 1% because prices are sticky and the aggregate supply curve is not vertical. However, for the case of perfectly flexible prices ($\gamma = 0$) we have $\Delta y^* = 1\%$; $\Delta p = -0.5\%$; and $\Delta m = 0.5\%$. The increase in aggregate supply is half matched by an increase in aggregate demand, so the inflation rate falls by half the amount of the aggregate supply shock. Clearly if there was no change in aggregate demand (i.e., if banks did not expand their issues of broad money) then Δy^*

= 1% would have to be fully matched by $\Delta p = -1\%$ for the macroeconomic equation of exchange to continue to hold true ($m + v = p + y$).

While the response of a free banking system to aggregate supply shocks has not been previously explored in the literature, the above findings are intuitive. Consider the perfectly flexible prices case ($\gamma = 0$). When there is a positive aggregate supply shock ($\Delta y^* > 0$) the number of potential transactions to be carried out increases. As downward pressure begins to manifest on the inflation rate, agents in the economy attempt to carry out more of those transactions. Banks can facilitate this by increasing their issuance of broad money. (This can mechanically be seen in the relationship (2.6) where, all else equal, an increase in Y is associated with an increase in M .) As banks issue more money this exerts an offsetting upward effect on the inflation rate. In an economy with only aggregate supply shocks, all variation in the real growth rate (y) would tend to be accompanied by inverse variation in the inflation rate. But a free banking system would accommodate those real shocks with growth in the broad money supply, stabilizing the inflation rate over time.

A graphical illustration of the flexible price-aggregate supply shock scenario is presented in **figure 2**. Notably, in the absence of the increase in broad money supply growth by banks, NGDP growth would be stabilized; the increase output growth would be one-for-one offset by a fall in inflation. However, output growth leads to (transaction) money demand growth and banks accommodate by issuing more broad money. Because banks expand their balance sheets and stimulate aggregate demand, the fall in inflation is less than one-for-one and NGDP growth increases. The free banking system stabilizes the inflation rate, leading to higher NGDP growth. In general, if only aggregate supply shocks disturbed the economy over time, the free banking system would stabilize inflation at the expense of stable NGDP growth. To wit: faced with

aggregate supply shocks, the free banking system acts as an inflation targeter rather than an NGDP targeter.

This result is remarkable because conventional macroeconomic wisdom holds that deflation is inconsistent with economic stability, and thus an NGDP targeting rule must create deflation in response to a positive supply shock that increases the real growth rate. Proponents of NGDP targeting responded in large part by arguing that there is a distinction between “bad” deflation caused by a contraction of aggregate demand) and “good” (or at least “not bad”) deflation associated with positive aggregate supply shocks (e.g., Selgin, 1995; Beckworth, 2008). Evaluating a distinction between “good” versus “bad” deflation is well beyond the scope of this paper. Suffice to say, many economists and policymakers are unlikely to view deflation of any kind as an acceptable – never mind a purposefully orchestrated! – outcome of monetary policy. Since a free banking system will create some inflation, compared to what otherwise would have prevailed, in the event of a positive supply shock, such a system may help the political-economic system coordinate around a more preferred political equilibrium.

Furthermore, a central bank cannot identify aggregate supply versus aggregate demand shocks in anything approximating real time (e.g. Beckworth 2012). *Target NGDP in response to aggregate demand shocks but not in response to aggregate supply shocks* as a monetary rule is, essentially, no rule at all. If a free banking system can be viewed as an institutional ‘technology’ for achieving macroeconomic stability, its virtue is that it produces an outcome consistent with such a directive. Since the free banking system in this scenario is a decentralized monetary policy implementation scheme, and acts within rather than upon the market, it is more likely to achieve the desired macroeconomic result than a central bank. The latter faces familiar difficulties with respect to the implementation of its mandate, namely knowledge problems and

incentive problems (Salter 2014), which the banks comprising a free banking system do not confront, precisely because of (a) the decentralized environment, and (b) the discipline imposed by market profit-and-loss constraints.

4. Conclusion

Using a simple model, we have shown that a free banking system does stabilize nominal income in response to aggregate demand shocks. However, the free banking system functions more closely to an inflation target in the event of an aggregate supply shock. Others have shown the former, but to our knowledge, we are the first to show the somewhat surprising result of the latter.

We have purposefully omitted considerations of welfare from the model. Rather than postulate some hypothetical loss function and see whether idealized free banking outperforms idealized central banking, we have focused on comparative static results for familiar macro variables in a Marshallian framework. Derivation of these results in a Walrasian model, similar to Hendrickson (2015), can serve as a robustness check, but we do not believe this is the most fruitful line of research. Instead, we believe future efforts aimed at ascertaining the most effective monetary environment should focus on the institutional framework underlying economic activity. Focusing on the form and content of monetary institutions directs attention away from idealized results, and can focus on how monetary institutions cope with the various information and incentive frictions that characterize real-world economic activity. We believe there is much to be gained from studying free banking, and NGDP targeting more generally, in the tradition of ‘monetary constitutionalism’ (Yeager 1962; White et al. 2014). In this framework, the greatest strength of a free banking system is its ability to generate desirable

macroeconomic effects, given an underlying legal-political framework that protects private property rights, enforces contracts, and upholds the rule of law. No specific rules unique to the banking or financial sector are necessary to achieve the results we, and others before us, have derived. In contrast, the requirements for central banking to generate desirable macroeconomic results seem much more stringent. The actual results of central banking systems have not been, contrary to popular belief, unambiguously better than the admittedly-imperfect commodity standards that preceded them (e.g. Selgin et al. 2012; Hogan 2014). Taken collectively, these results seriously question central banking's robustness (Salter 2015), which implies that an idealized central bank voluntarily adopting a nominal income target is an irrelevant counterfactual. Even if it can be shown—and we believe it can—that a free banking system's moderately procyclical behavior in response to supply shocks is not the best of all possible worlds, the proper question is whether it is the best of *actually achievable* worlds.

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Fig. 1. Adjustment of the free banking economy to a negative aggregate demand shock.

Fig. 2. Adjustment of the free banking economy to a positive aggregate supply shock: case of flexible prices ($\gamma = 0$).