

A Comparative Institutional Analysis of Free Banking and Central Bank NGDP Targeting

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Abstract

This paper argues that the choice between free banking and central bank NGDP targeting is a difficult to answer empirical question, contrary to the position of those on either side of the debate. Public choice concerns, the lack of the signals of profit and loss, and optimal determination of currency areas are points against any form of central banking. However, free banking may be suboptimal relative to central bank NGDP targeting for three reasons explored here. Until more data become available, it is impossible to gauge the relative importance of one set of these tradeoffs against the other.

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I. Introduction

As the Great Recession continued, some of the most ardent supporters of the free market began entertaining the possibility that “demand-side” problems were causing persistent unemployment. Although the right-wing press has criticized the untraditional behavior of central banks, monetary policy actually appeared tight by the standard set forth by one of the most eminent and stringent inflation hawks of the 20th century, F.A. Hayek. This standard requires constant total overall spending in the economy (Hayek, 1931; White, 1999). This implies that M^*V should be kept at a constant level for money to remain “neutral.” Following the equation of exchange, this is in effect the same as a Nominal Gross Domestic Product (NGDP) target of 0%. For the first time in many years, NGDP fell in the United States, suggesting that money may have been too tight from the standpoint of even Hayek.

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A number of economists have pointed out that NGDP was allowed to fall during the recession. Modern mainstream macroeconomists had taken some version of NGDP targeting seriously in the past, albeit with a target greater than 0% (e.g., Hall and Mankiw, 1994; see Frankel, 2012 for an informal literature review). Many prominent economists and commentators have since come out in favor of this policy objective in place of other targets for central banks (Woodford, 2012; Romer, 2011; Cowen, 2011; Krugman, 2011; Goldman Sachs [Goldstein, 2011]; Barro, 2012; Avent, 2011). Meanwhile, many advocates of free markets coalesced around this policy objective as a solution to aggregate demand deficiencies that did not resort to fiscal policy. This latter position, led primarily by economist Scott Sumner, became known as market monetarism.

Meanwhile, modern followers of Hayek had moved in an entirely different direction prior to the crisis arising in the first place. Concerned with a central bank's ability to possess the necessary information and incentives to perform effective monetary policy, this group identified an alternative institutional framework that would not succumb to those problems. By deregulating banks and the supply of money, competitive pressures would constrain private banks in such a way that their note issue would follow a logic consistent with consumer demands for money. This institutional arrangement, known as "free banking," would yield an approximation of NGDP targeting—a "productivity norm" (Selgin, 1997)—that has many similarities to the policy Hayek originally envisioned.

Early on in the Great Recession, the Cato Institute sponsored a symposium intended for the public that allowed Sumner (before the phrase "market monetarism" was coined) to present his position that money was too tight to an audience that would typically believe the opposite (Sumner, 2009). Among those responding to his position were free banking advocates taking notice of how similar the two schools of thought were. For example, "Scott Sumner's general views on macroeconomics are so much in harmony with my own that, in commenting on the present essay, I'm hard pressed to steer clear of the Scylla of fulsomeness without being drawn into a Charybdis of pettifoggery" (Selgin, 2009). This paper can be seen as a continuation of this exchange but from a slightly different perspective. Instead of determining what monetary policy is optimal to escape the Great Recession, I wish to contrast the effectiveness of free banking and

central bank NGDP targeting in overcoming obstacles to minimizing long-run unemployment.

There are a number of well-honed objections to central banking from the standpoint of the Hayekians, the best three of which I will discuss. Objections to free banking, especially for those who take the concerns of Hayekians very seriously, are less common; objections to free banking typically involve attempting to pull the rug out from under it using standard market failure arguments. In place of that, this paper seeks to identify issues in optimally targeting NGDP that would arise under free banking but not under central banking. The disagreement then devolves into a set of empirical questions that are difficult to answer satisfactorily.

Part II will review the standard objections to central bank NGDP targeting. Part III will provide what I believe are legitimate concerns in the efficacy of the free banking system. Part IV will offer interpretation and policy prescription. Part V concludes.

II. Objections to Central Bank NGDP Targeting

There are three traditional economic objections to central banking made by proponents of free banking. One, although economists may have an ideal monetary policy, central bankers have their own sets of incentives. Two, central banks, because they are a top-down mechanism, lack the information a market setting provides. Three, central banks have no way of determining the optimal currency area, and the size of the currency area in practice is merely determined by arbitrary political boundaries. In these ways free banking is superior to any policy for central banks.

1. Public Choice

What economists believe a central bank should do and what central banks do in practice are two different things. Famously, Arthur F. Burns was notorious for caving in to political pressure from Richard Nixon, who pressed for monetary stimulus in time for the 1972 election. The field of public choice within economics acknowledges that government officials and bureaucrats are human beings, and whatever assumptions we make about individuals acting on the market and within government should be symmetrical (Brennan and Buchanan, 2000, pp. 53–75). If economists assume narrowly defined self-interest when it comes to the behavior of

financial institutions, they should assume narrowly defined self-interest when it comes to central bankers.

Good outcomes in central banking require that the central bankers possess a certain public-spiritedness, the correct ideology, or a desire to be well-liked among economists. Otherwise, a narrow utility maximizer will take advantage of the powers of central banks (Wagner, 1986; White, 1988; see especially Boettke and Smith, 2012). Advocates of free banking make no such assumption about individuals in their banking system. It is driven entirely by the signals of profit and loss. In *assuming* one of the very dangers of central banking, free banking advocates are able to show how their system will still work. On this margin, free banking is far more robust than central banking.

2. *The Knowledge Problem*

Central banks lack the knowledge requisite for optimal macroeconomic outcomes (Butos, 1986; Selgin, 1988, pp. 89–94; see also Hayek, 1978). Assume away all public choice issues mentioned above. In that case, one would still be left a bureaucracy hoping it is doing more good than harm. The situation is as Mises described the behavior of bureaucracy (1944). Even if we have altruistic central bankers, they will still possess less knowledge than a system of profit and loss would provide.

This may sound like making a mountain out of a molehill, because Western central banks have the most sophisticated modeling devices in the world available to them. Here is an example that will appeal to most economists' intuitions. What is the better mechanism for determining what the price of an orange should be, a sophisticated computer model or supply and demand? Most economists would probably say supply and demand.¹ Another set of prices on the market are interest rates. In manipulating the supply of money, the central bank in effect sets the price of all of these interest rates. Free banking proposes that we instead allow these prices to be determined by supply and demand.

One counterargument to this is that the central bank can use a futures market to determine what the market expects the path of NGDP to be (Sumner, 2011a). Under this proposed regime, the

¹ This can in some ways be seen as analogous to who was right in the socialist calculation debate. See Christensen (2012a).

government subsidizes into existence an NGDP futures market with which it directs monetary policy. This may be an improvement over modeling. However, this assumes the efficient market hypothesis (EMH), and it is unclear whether EMH is still a mainstream position. Because it assumes markets are in equilibrium, it is certainly antithetical to how most free banking proponents view the way economies function (Pasour, 1989). Although prediction markets incorporate some dispersed knowledge, they are no substitutes for unhindered market institutions developed via the competitive process.

3. The Scope of the Currency

Local economies may be over- or under-shooting their monetary equilibrium at any given moment, relative to the economy overall (Mundell, 1961; Beckworth, 2010). Unfortunately, a central bank charged with adjusting an economy the size of the United States has very blunt tools to perform that function. The path of NGDP for the whole of the United States may be too low, but in specific regions it may be too high. Using a top-down approach, there are significant barriers to determining with any accuracy the size of optimal currency areas. In free banking, this would be done automatically as individuals weigh tradeoffs implicit in their choice of competing banknotes. Supply and demand would in turn offer a tendency toward an optimal equilibrium for the geographical scope of a currency, as opposed to allowing it to be determined by the vagaries of politics. Given the tradeoffs now made obvious by the euro, this issue should not be dismissed as a concern of secondary importance.

III. Objections to Free Banking

There are certain problems faced by free banking that are not faced by central banks. Central banks have more straightforward mechanisms for curtailing the effects of expansionary central banks outside their currency area. Central banks would also be able to increase the NGDP target should it be the case that the productivity norm provides too little inflation to achieve full employment. Certain (though perhaps not most) consumers may also choose forms of money and banking that do not follow the logic of free banking, and this may adversely affect the ability of the free banking system to reliably achieve its implicit target.

1. *Non-Neutral Injections from Foreign Central Banks*

International economics has been briefly discussed² in the free banking literature, but I believe it understates how damaging the presence of outside central banks is to an economy with free banking. Currency devaluation by foreign central banks may push the free banking system off the optimal path for NGDP growth. The intention, after all, of currency devaluation is to improve the balance of payments by increasing exports and decreasing imports. Some of the increase in exports would likely be purchased by individuals in the free banking zone, and NGDP will grow faster than optimal. It is possible that this will be mediated by exchange rates, but it is unclear if it will; it depends on elasticities.

If devaluation by foreign central banks has no effect on trade balances and it is perfectly mediated via the exchange rates, this means that the “Marshall-Lerner condition” does not hold (see Krugman and Obstfeld, 2009, pp. 457–59). As long as the price elasticities of exports and imports are greater than one, it will improve the trade balance of the country which devalues. Modern literature has established firmer microfoundations for why this is true, such as local costs driving a wedge between prices and imported costs (Burstein et al., 2003), oligopolistic markets (Atkeson and Burstein, 2008), and price rigidity (Bacchetta and van Wincoop, 2003).

Let M_F and V_F represent the money issued by banks inside the free banking system. Let M_Z and V_Z represent the money issued by foreign central banks that effectively contributes to NGDP within the currency area (whether directly by individuals or indirectly through financial markets). Finally, let $P_{F/Z}$ represent the exchange rate between the two types of currencies. Then,

$$NGDP = M_F V_F + M_Z V_Z P_{F/Z}.$$

If M_Z increases as a result of currency devaluation, M_F would need not fall in lockstep to counteract the injection in currency, as there is no profit incentive for the unregulated banks to behave that way. Furthermore, financial markets may not adjust such that $P_{F/Z}$

² See Cachanosky (2012) for an exhaustive review of this small literature. The closest discussion of the problem I am describing here can be found in Hoffman (2010).

falls so as to guarantee that NGDP returns to its optimal growth rate; again, that depends on elasticities. This means that the productivity norm will not be maintained unless the elasticities are just right.

Once NGDP is pushed off the optimal path, the pernicious effects of an oversupply of money may occur, whether that means monetary disequilibrium, the Keynesian “overheating” story, or Austrian business cycle (Horwitz, 2000). However, this would not have happened under a central bank targeting NGDP. It would observe the increase in NGDP and contract the money supply to counteract it. These concerns are not idle musings, either; foreign lending causing excessive expansion has a classic example in Thailand’s 1997 crisis. The central bank was behaving reasonably well by central banking standards (though not targeting NGDP), but loanable funds were flooding in from other nations anxious to lend. If Thailand’s central bank had been targeting NGDP, there is no reason why this would have happened (Christensen, 2012b).

2. Pathological Wage Stickiness

Modern economists believe that a little bit of inflation is good, and not because it is desirable to continually try subverting expectations. They believe there are structural and pathological issues that are simplified when the value of currency is continuously declining. “We know wages are extremely sticky, we just don’t know why,” writes Sumner (2011b). If this is true—and it is a widely held view among economists—then the case for the pure productivity norm is weakened.³ Even if, on average, wages stay the same, employers will struggle to reduce the wages of those whose productivity deserves a wage cut. Although Selgin (1997) has addressed many of these issues, and he has dismissed the idea that inflation is necessary for full employment as “dubious” (1988, p. 150), alternative expositions of this argument maintain academic respectability. The more modern perspective, articulated for instance by Christiano et al. (2005), Akerlof et al. (1996), Card and Hyslop (1997), and Kahn (1997), is more resistant to Selgin’s responses.

As Selgin argues, if 0% inflation is sufficient to avert unemployment caused by wage stickiness, then 1% deflation will not cause unemployment when it coincides with a 1% increase in

³This version of wage stickiness argues that the view that observed wage stickiness is not merely the result of current institutional arrangements.

productivity. Overall consumer prices will fall and wages will stay constant. But this is not the issue that modern wage stickiness is about. If agents are identical and there is no need to shift workers between industries, a productivity norm will work. But once we need to reallocate workers between different industries, wages in certain industries would need to rise while others fall. Their proposed solution is to continually pump inflation into the economy (although obviously *not* at an increasing rate) so that workers may be reallocated between industries using price signals without requiring certain individuals' wages to fall.

There are two interpretations to this issue, if modern wage stickiness is correct. Perhaps economies may not “overheat” until a certain rate of inflation associated with full employment is reached, even in the long run. Alternatively, the economy may achieve sustainable growth only at very low levels of inflation (or, per Selgin, deflation), but the money illusion still causes unemployment at these low levels of inflation.

In the latter interpretation, effectively there is a tradeoff between unemployment caused by the business cycle and unemployment caused by the money illusion. If one targets inflation to eliminate the money illusion, unemployment in years 1 to 4 may be 5%, 5%, 5%, and 10%. If one suppresses inflation as extensively as Selgin recommends, unemployment in years 1 to 4 may be 7%, 7%, 7%, and 7%. It is not clear which of these two states of the world is better. Furthermore, by jiggering those values around in a way that maintains the intuition and stays in the realm of reasonability, we can find a situation in which it is clearly better to have low unemployment normally, with the occasional business cycle, than it is to eliminate the business cycle.⁴ With a central bank, we can reach a possibly desirable higher NGDP target than we would under free banking if modern wage stickiness is in fact right. It is unclear what mechanism would allow us to reach it under free banking.

3. Market Demand for Confounding Forms of Money and Banking

Selgin (1988) and Selgin and White (1994) have argued, using both theory and historical case studies, that the unregulated market

⁴ Of course, there is resource destruction with a business cycle, which is another cost, but it can hardly be assumed that this a priori makes the state of the world with inflation worse.

would employ the type of free banking system they specify in their work. Free banking scholars have used a conjectural history of banking systems in the absence of government regulation, employing accounts of many nearly unregulated banking systems as a guide. They fault the work of other scholars investigating unregulated banking systems for being flatly ahistorical:

The value of [studies of unregulated payment systems] is limited, however, by their authors' use of ad hoc assumptions, ranging from the proliferation of competing fiat currencies at one extreme to the complete absence of money at the other. To be really useful in interpreting the effects of regulation in the past, or in predicting the consequences of deregulation in the future, a theory of unregulated banking should be based on *realistic* assumptions drawn, if possible, from actual experience. (Selgin, 1988, p. 16, emphasis in original)

The historical tendency toward the use of the system they specify is not what is disputed. Instead, a portion of the supply of money may be fulfilled via institutions outside the free banking system. Although free banking theorists have demonstrated that unregulated currency areas have tended toward free banking, they have not demonstrated that *100% of money* will be supplied using these means. Perhaps 0.01%, 10%, or 50% of money will be supplied using alternatives; we just do not know.

Financial instruments are regularly invented in modern economies, many of which often behave “like” money. And we should not forget that economists are unable to draw bright lines as to what even constitutes money. Even if we believe that notes that fall under the aegis of a free banking regime will completely dominate typical transactions (thereby *entirely* granting the free banking historical argument), other forms of payment may play significant roles (as they do today) in financial transactions. These free market alternatives (again, some of which are used today) to free banking include:

1. Money-less payment systems, i.e., the original intention of Paypal. Such systems may develop their own institutional rules governing their currencies, but if they do not use base “outside” money, they will not have the profit motive to target NGDP.

2. The BFH system (Greenfield and Yeager, 1983), which targets the value of a pool of goods and services.
3. Bitcoins, an online currency of which there will eventually be a static total of 21 million units (Lowenthal, 2011). These could be potentially used as base money in the free banking system, but they could also follow another rule, such as inflation targeting.
4. More “traditional” currencies that consciously target inflation (Klein, 1974; Hayek, 1976).
5. Local currencies intending to keep production localized (Swann and Witt, 1997; Pacione, 1997). The most prominent of these currencies, the Berkshares, presently pegs exchange rates, but there is talk of pegging it to the value of local commodities (O’Brien, 2011).
6. 100% reserve commodity banking, under which the money supply grows only if more of the commodity is produced.

These systems of payment may not be a significant portion of the market, but they could be. And regardless of how small a part of the market they take up, their presence inhibits the ability of the free banking system to attain a productivity norm in equilibrium. For instance, if 25% of the market uses inflation-targeting currencies, the economy overall will overshoot the productivity norm. Free banking’s clearinghouse mechanism has no discernible reason to incentivize banks to contract their quantity of inside money in response to the overshooting.

An NGDP-targeting central bank would be able to solve this by forcing more money or pulling it out to counteract the effects of these parallel regimes. There is no theoretical reason why firms operating under a free banking regime would have the profit motive to do so. Whether this an important or an insignificant issue in practice, the NGDP-targeting central bank would eliminate it, whereas under free banking deviations from the productivity norm may persist indefinitely.

IV. Implications and Policy Prescription

The magnitudes of each of these concerns are empirical questions. However, because the problems with NGDP targeting are also present under status quo monetary policy, both market monetarists and free bankers should prefer NGDP targeting over status quo. Still, it is difficult to imagine fixing the fundamental

problems with central banking. No amount of rule setting offers the same discipline the market does. Public choice problems will always remain no matter how angelic we hope bureaucrats will one day become. In contrast, the potential problems with free banking are “mere” questions of magnitude in the sense that we just do not have a very good idea about how important they would really be under free banking in modern economies. We also are in no position to know that entrepreneurs will be unable to “get around” these issues. As such, it is reasonable to consider free banking as an ideal, if utopian goal. For now, however, NGDP targeting is an important step in getting there, if only as part of a grander “privatization strategy” (Christensen, 2011) (see Table 1).

Because we lack many modern examples of free banking, it is difficult to determine the relative magnitudes of these problems under each of the institutional arrangements. Although all economists may have their priors regarding the importance of each problem, what is most needed is more experimentation and data—in Hayek’s words, “tinkering.” If NGDP targeting is implemented, different Western nations should experiment with different targets. Some nations should experiment with a very low target, including zero. At that point, we will begin having stronger evidence of whether or not wage stickiness is the type of problem some economists insist it is.

A small country such as Singapore or Hong Kong may be the best starting point for performing a full experiment with free banking. It may be necessary, however, for the government to first institute rather draconian capital controls to ensure that excessive foreign loanable funds do not enter the country. If and when the

**Table 1: Summary of Tradeoffs
for Central Bank NGDP Targeting and Free Banking**

	NGDP-Targeting Central Bank	Free Banking
Incentives	–	+
Knowledge problems	–	+
Optimized currency area	–	+
Non-neutral injections from foreign central banks	+	–
Pathological wage stickiness	+	–
Market demand for other institutional arrangements	+	–

supremacy of free banking is demonstrated on all margins except international trade, one could then remove the capital controls and see if issues then arise.

V. Conclusion

There are good arguments questioning both central bank NGDP targeting and free banking. Incentives and information (in both the Hayekian sense and in determining the optimal currency area) are excellent reasons why we should relegate the supply of currency to a system governed by profit and loss. But there are at least three confounding issues that seem to be better solved through central banks. Of course, the strengths of entrepreneurship and the market in general are that they discover solutions where the blackboard may tell us not to expect solutions. That is why it is desirable to see the elimination of the central bank as an ideal to tinker toward, but at the same time it is extremely undesirable to lose sight of the clear superiority of NGDP targeting to the present system. Furthermore, free banking advocates must take these issues seriously, and until scholarship shows otherwise, the efficacy of free banking versus an NGDP targeting central bank is an empirical question, and an empirical question for which there is little empirical evidence.

References

- Akerlof, George, William T. Dickens, and George L. Perry. 1996. "The Macroeconomics of Low Inflation." *Brookings Papers on Economic Activity*, 27(1): 1–76.
- Atkeson, Andrew, and Ariel T. Burstein. 2008. "Pricing-to-Market, Trade Costs, and International Relative Prices." *American Economic Review*, 98(5): 1998–2031.
- Avent, Ryan. 2011. "Monetary Policy: The Case for an NGDP Target." *Free Exchange*, November 1.
- Bacchetta, Phillipe, and Eric van Wincoop. 2003. "Why Do Consumer Prices React Less Than Import Prices to Exchange Rates?" *Journal of the European Economic Association*, 1(2–3): 662–70.
- Barro, Josh. 2012. "Inflation Only Gets Out of Control if You Let It." *Forbes*, March 16.
- Beckworth, David. 2010. "One Nation under the Fed? The Asymmetric Effects of US Monetary Policy and Its Implications for the United

- States as an Optimal Currency Area.” *Journal of Macroeconomics*, 32(3): 732–46.
- Boettke, Peter J., and Daniel J. Smith. 2012. “Monetary Policy and the Quest for Robust Political Economy.” Working paper, Department of Economics, Mercatus Center at George Mason University.
- Brennan, Geoffrey, and James Buchanan. 2000. *The Reason of Rules*. Indianapolis, IN: Liberty Press.
- Burstein, Ariel T., Joao C. Neves, and Sergio Rebelo. 2003. “Distribution Costs and Real Exchange Rate Dynamics During Exchange-Rate-Based Stabilizations.” *Journal of Monetary Economics*, 50: 1189–214.
- Butos, William N. 1986. “The Knowledge Problem under Alternative Monetary Regimes.” *Cato Journal*, 5(3): 849–76.
- Cachanosky, Nicolas. 2013. “The Mises-Hayek Business Cycle Theory, Fiat Currencies, and Open Economies.” *The Review of Austrian Economics* (forthcoming). doi:10.1007/s11138-012-0188-2
- Card, David, and Dean Hyslop. 1997. “Does inflation ‘grease the wheels of the labor market?’” In *Reducing Inflation*, ed. Christina Romer and David Romer, 71–121. Chicago: University of Chicago Press.
- Cowen, Tyler. 2011. “A Few Quick Thoughts on the Likely Pending S&P Downgrade.” *Marginal Revolution*, August 5.
- Christensen, Lars. 2011. “Scott Sumner and the Case Against Currency Monopoly...or How to Privatize the Fed.” *The Market Monetarist*, October 23.
- Christensen, Lars. 2012a. “Is Market Monetarism Just Market Socialism?” *The Market Monetarist*, April 4.
- Christensen, Lars. 2012b. “NGDP Targeting Would Have Prevented the Asian Crisis.” *The Market Monetarist*, January 3.
- Christiano, Lawrence J., Martin Eichenbaum, and Charles L. Evans. 2005. “Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy.” *Journal of Political Economy*, 113(1): 1–45.
- Frankel, Jeff. 2012. “Nominal GDP Targeting Could Take the Place of Inflation Targeting.” *Jeff Frankels Weblog*, June 13.
- Goldstein, Steve. 2011. “Fed Should Adopt GDP Target, Goldman Says.” *MarketWatch*, October 17.
- Greenfield, Robert L., and Leland B. Yeager. 1983. “A Laissez-Faire Approach to Monetary Stability.” *Journal of Money, Banking and Credit*, 15(3): 302–15.

- Hall, Robert E., and N. Gregory Mankiw. 1994. "Nominal Income Targeting." In *Monetary Policy*, ed. N. Gregory Mankiw, 71–93. Chicago: University of Chicago Press.
- Hayek, F.A. 1931. *Prices and Production*. London: Routledge.
- Hayek, F.A. 1976. *Denationalisation of Money—The Argument Refined*. London: Institute of Economic Affairs.
- Hayek, F.A. 1978. "Competition as a Discovery Procedure." In *New Studies in Philosophy, Politics, Economics, and the History of Ideas*, 179–90. Chicago: University of Chicago Press.
- Hoffman, Andreas. 2010. "An Overinvestment Cycle in Central and Eastern Europe?" *Metroeconomica*, 61(4): 711–34.
- Horwitz, Steven. 2000. *Microfoundations and Macroeconomics: An Austrian Perspective*. New York: Routledge.
- Kahn, Shulamit. 1997. "Evidence of Nominal Wage Stickiness from Microdata." *American Economic Review*, 87(5): 993–1008.
- Klein, Benjamin. 1974. "The Competitive Supply of Money." *Journal of Money, Credit, and Banking*, 6(4): 423–53.
- Krugman, Paul. 2011. "Getting Nominal." *The Conscience of a Liberal*, October 19.
- Krugman, Paul, and Maurice Obstfeld. 2009. *International Economics: Theory & Policy*. New York: Addison Wesley.
- Lowenthal, Thomas. 2011. "Bitcoin: Inside the Encrypted, Peer-to-Peer Digital Currency." *Ars Technica*, June 8.
- Mises, Ludwig von. 1944. *Bureaucracy*. New Haven: Yale Institute Press.
- Mundell, Robert A. 1961. "A Theory of Optimum Currency Areas." *American Economic Review*, 51(4): 657–65.
- O'Brien, Jane. 2011. "Berkshares Boost the Berkshires in Massachusetts." *BBC News*, September 6.
- Pacione, Michael. 1997. "Local Exchange Trading Systems as a Response to the Globalisation of Capitalism." *Urban Studies*, 34(8): 1179–99.
- Pasour, Ernest C. 1989. "The Efficient-Markets Hypothesis and Entrepreneurship." *Review of Austrian Economics*, 3(1): 95–107.
- Romer, Christina. 2011. "Dear Ben: It's Time for a Volker Moment." *New York Times*, October 29.

- Selgin, George. 1988. *The Theory of Free Banking: Money Supply under Competitive Note Issue*. Lanham, MD: Rowman & Littlefield Publishers.
- Selgin, George. 1997. *Less than Zero: The Case for a Falling Price Level in a Growing Economy*. London: Institute of Economic Affairs.
- Selgin, George. 2009. "Between Fulsomeness and Pettifoggery: A Reply to Sumner." *Cato Unbound*, September 18.
- Selgin, George, and Lawrence H. White. 1994. "How Would the Invisible Hand Handle Money?" *Journal of Economic Literature*, 32(4): 1718–49.
- Sumner, Scott. 2009. "The Real Problem was Nominal." *Cato Unbound*, September 14.
- Sumner, Scott. 2011a. *The Case for NGDP Targeting: Lessons from the Great Recession*. London: Adam Smith Institute.
- Sumner, Scott. 2011b. "We Know Wages Are Extremely Sticky, We Just Don't Know Why." *The Money Illusion*, September 15.
- Swann, Robert, and Susan Witt. 1997. "Local Currencies: Catalysts for Sustainable Regional Economies." In *People, Land, and Community: Collected E. F. Schumacher Society Lectures*, ed. Hildegard Hannum, 121–32. New Haven, CT: Yale University Press.
- Wagner, Richard E. 1986. "Central Banking and the Fed: A Public Choice Perspective." *Cato Journal*, 6(2): 519–43.
- White, Lawrence H. 1988. "Depoliticizing the Supply of Money." In *Political Business Cycles: The Political Economy of Money, Inflation, and Unemployment*, ed. Thomas D. Willet, 460–78. Durham, NC: Duke University Press.
- White, Lawrence H. 1999. "Hayek's Monetary Theory and Policy: A Critical Reconstruction." *Journal of Money, Credit & Banking*, 31(1): 109–20.
- Woodford, Michael. 2012. "Methods of Policy Accommodation at the Interest-Rate Lower Bound." Paper presented at the Changing Policy Landscape Symposium, Jackson Hole, WY.