Interest rate exogeneity: Theory, evidence and policy issues for the U.S. economy

The idea of an exogenous money supply—controlled entirely through central bank interventions—was a fundamental tenet of monetarism and New Classical economics. Post Keynesians have developed an extensive literature arguing that the money supply is in fact endogenous—that market forces combine with central banks in establishing the money supply. But Post Keynesians disagree on a related question: to what extent are interest rates set exogenously by central banks? This paper presents evidence regarding the movement of interest rates in U.S. financial markets relative to the Federal Reserve-controlled Federal Funds rate. Concluding that market interest rates are primarily set through market forces, that is, are largely endogenous. This is the instability of deregulated financial markets, which leads market participants to make wide swings in their risk assessments over time. It follows that effective regulatory policies to stabilize markets and control interest rates directly will increase the degree of interest rate exogeneity.

La idea de una oferta monetaria exógena—controlada en su totalidad mediante intervenciones del banco central—fue un principio fundamental del monetarismo y la Nueva Economía Clásica. Por el contrario, los postkeynesianos han defendido que la oferta de dinero es, de hecho, endógena—las fuerzas de mercado se combinan con los bancos centrales a la hora de establecer la oferta de dinero. Pero los postkeynesianos se preguntan hasta qué punto los bancos centrales fijan exógenamente los tipos de interés. Este artículo presenta pruebas respecto a los movimientos de los tipos de interés en los mercados financieros estadounidenses relativos a los tipos de interés de los Fondos Federales fijados por la Reserva Federal. Se llega a la conclusión de que los tipos de interés están establecidos fundamentalmente por las fuerzas de mercado, es decir., son en gran medida endógenos, lo cual lleva a los agentes de mercado a tener grandes oscilaciones en sus evaluaciones de riesgo a lo largo del tiempo. De ahí que las políticas reguladoras efectivas para estabilizar los mercados y controlar los tipos de interés directamente harán aumentar el grado de exogeneidad del tipo de interés.

Moneta-eskaintza exogenoaren ideia —guztiz kontrolatuta banku zentralaren esku-hartzeen bitartez— funtsezko printzipioa izan zen monetarismorako eta Ekonomia Klasiko Berrirako. Aldiz, postkeynesiarrek diote diruaren eskaintza, berez, endogenoa dela; merkatuaren indarrak banku zentralekin biltzen dira diruaren eskaintza ezartzeko. Baina postkeynesiarrek beste zalantza bat dute: zein neurritan ezartzen dituzte banku zentralek interes-tasak modu exogenoan? Artikulu honetan frogak azaltzen dira Estatu Batuetako finantza-merkatuetako interes-tasen mugimenduei buruz, Erreserba Federalak ezarritako Fondo Federalen interes-tasen arabera. Ondorioztatu da interes-tasak batez ere merkatu-indarren arabera daudela ezarrita, hau da, endogenoak direla neurri handi batean; horrenbestez, merkatuko agenteek gorabehera handiak dituzte denboran egindako arrisku-ebaluazioetan. Hori dela eta, merkatuak egonkortu eta interes-tasak zuzenean kontrolatzeko politika arautzaile eraginkorrek handitu egingo dute interes-tasaren exogenotasuna.

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1. MONEY SUPPLY AND INTEREST RATES: ENDOGENOUS OR EXOGENOUS?

The idea of an exogenous money supply was a fundamental tenet of monetarism and New Classical economics. The quantity theory of money, MV = PY, frames the approach clearly. The theory assumes, at least in the short run, that the velocity of money (V) and real output (Y) will be constant, either in levels or growth rates. It then assumes that causation runs from the left to the right-hand side of the equation, meaning that variations in money growth (M) determine fluctuations in the price level (P)—i.e. the rate of inflation or deflation. Once the M →P relationship is established, it then follows that fluctuations in the money supply also determine changes in nominal income, PY. The quantity theory finally assumes that the Central Bank, on its own, has the capacity to determine M, through discount-window lending and dynamic open market operations.

Combining these elements, the conclusion emerges that the Central Bank exogenously controls the growth rate of the money supply, and through this capacity, will also then determine an economy's inflation rate and business cycle fluctuations. That is, within the quantity theory approach, broad changes in macroeconomic activity always emanate from the Central Bank's management of the money supply. Macroeconomic fluctuations may appear to emerge from endogenous market forces, such as the animal spirits of investors and their perceived credit needs, the capacity of financial institutions to innovate, the migration of financial markets from states of relative robustness to relative fragility, or the bargaining environment in labor markets.

* A longer version of this paper is forthcoming in Basil Moore and Louis-Phillipe Ronchon, *Post-Keynesian Monetary Theory: Reflections and Developments* (Northampton, MA: Edward Elgar Publishers). I am grateful to Jerry Epstein and Louis-Phillipe Rochon for useful comments on this work. Over a period of 20 years, I have also benefited from illuminating and spirited discussions with both of them and others on the broader set of issues addressed here.

But quantity theorists argued that such appearances are misleading.

Milton Friedman, in particular, used the quantity theory framework to reach powerful, if erroneous, conclusions about absolutely central questions in real world economics. Among other things, Friedman explained the 1930s Depression as having resulted from irresponsible Federal Reserve management that led to a massive contraction of the U.S. money supply. Friedman also argued that inflation was "always and everywhere" due to central banks allowing the money supply to expand faster than the potential growth rate of real output.[1] This was the analytic framework that led to the revival and ascendancy of monetarism and allied traditions, including the neoliberal approach to economic policy that, beginning in the 1970s and continuing to the present, has become dominant throughout the world.[2]

To advance a revived Keynesian theoretical approach, as well as a policy framework focused on promoting economic growth with full employment, it was necessary to develop a thoroughgoing critique of the notion of exogenous money embedded in the quantity theory. This is the historical context in which the early work on endogenous money theory of Kaldor, Minsky, Weintraub, Davidson, Rousseas and Moore emerged.[3]

When I began to focus on this issue in the mid 1980s, the efforts of these and other authors were already reasonably far advanced. They were all making important contributions in undermining the main propositions of the quantity theory and monetarism. But it was also clear that while these authors were united in their opposition to monetarism, they were not united in advancing a positive theory of money, credit and financial markets. Indeed, as I emphasized in my 1991 paper, their approaches were quite distinct. To my knowledge, Rousseas (1986) was the only one of this early set of authors to have explicitly noted and offered some extended observations on this fact.

By now, of course, there is a large literature that has pursued the relative strengths and weaknesses of the "structuralist" and "horizontalist" approaches to endogenous money theory.[4] I am quite pleased to have played some role in sparking new thinking and research work on these questions (Pollin 1991, 1996). At the same time, in reading through this more recent literature, it is not clear that there has been much progress toward reconciling the two approaches.

What I had said in that earlier work, and still believe today, is that the central tenets of an effective theory of money and finance are as follows: 1) The distinctions between money and non-money assets should be seen as matters of degree, and subject to change, as financial markets and practices evolve; 2) Innovation is a persistent feature of financial market practices, and the effects of this on market outcomes increase as the degree of market regulation declines; 3)

[1] Friedman (1968) is a good overview essay of his approach to monetary theory.

[2] Two valuable histories of neoliberalism are Harvey (2005) and Glyn (2006)

[3] Some representative references are Kaldor (1958, 1970, 1982), Minsky (1957, 1991), Weintraub (1978), Davidson (1972), Weintraub and Davidson (1973), Rousseas (1960, 1986), and Moore (1988).

[4] The collection of papers in Deleplace and Nell (1996) provides the most extensive survey of a second generation of thinking on this question, as well as on the relationship between Post Keynesian and Circuitists approaches to monetary theory.

Normal unregulated financial market practices inherently generate states of systemic instability, as financial market participants, operating to maximize profits under conditions of uncertainty, systematically assume riskier financial positions as cyclical expansions proceed; and 4) The conventionally measured velocity of money—expressed, for example as GDP/M1—cannot be assumed to be constant, but, rather, as a first approximation, should be assumed to be variable to a significant degree.

Moreover, these four concepts are closely interrelated. Innovation in financial markets are primarily driven by efforts to enhance both the liquidity and store of value functions of any given financial asset, such as a Certificate of Deposit, a credit derivative, or a securitized mortgage. asically, this means lowering the costs of converting relatively high-yielding illiquid assets into liquid assets. Such efforts at innovation lead to greater risk-taking, and thus, as Minsky (e.g. 1986) argued, an inherent tendency toward an increasingly fragile financial structure. Innovations in the use of financial assets will also lead to market participants economizing on more traditional liquid assets. This promotes a rise in conventionally measured velocity (e.g. GDP/M1).

In my view, this is a highly flexible and fruitful framework in which to analyze the degree to which a Central Bank can influence the net flows of any given set of liquid assets that are bundled together to define "the money supply," regardless of whether we are referring to a narrow measure of the money supply (e.g. M1) or broader measures (e.g. M2, M3, etc.) It is also an effective framework in which to assess the extent to which a Central Bank can influence the setting of interest rates—and here I am referring to the full range of rates on financial markets, not simply the Federal Funds rate or the Discount rate. Finally, it is most effective framework for considering policy measures to promote economic growth, widely-shared access to affordable credit, and financial market stability.

The horizontalist approach is focused around a more narrow set of analytic questions and policy concerns. Leaving aside for now discussions about inflation theory, Rochon and Vernengo (2001, p. 3) summarize the horizontalist approach as focusing around two key assertions: 1) "the rate of interest is exogenous; the monetary authorities set it"; and 2) "The money supply—if such an expression is ever appropriate—is fully endogenous. This severs the relationship between the rate of interest and the growth of money." These are of course strong assertions, and need to be backed up through research. To give proponents of horizonalism their fair due, they have explored these positions at considerable length.

There are elements of these two assertions that are compatible with my own conception what constitutes an effective approach to understanding money, credit, and financial markets. There are other elements which are incompatible. I do not intend to work through detailed, point-by-point, explications as to which pieces fit together and which pieces don't. As it is, Rochon and Vernengo have said that the debate between structuralists and horizontalists had reached a point of "sterility" which "took a heavy toll on participants (2001, p. 1)." Wray echoed the same sentiment in commenting that he'd "rather watch paint dry than sit through yet

another attempt to explicate and synthesize horizontalism and structuralism," (2006, p. 271).

What I think might be more fruitful is to break down the whole set of issues into component parts, with the hope of sharpening the discussion around some of these more focused questions. In this spirit, in this paper, I want to consider two specific interrelated questions that flow out of these broader debates as I read them.

The first question I wish to address is, "to what extent are interest rates exogenous?" I emphasize the plural term here—interest *rates*. he specific matter I wish to explore is this. Considering the U.S. economy as our empirical case study, let us allow for the current discussion that the Federal Funds rate can be set exogeously by the Federal Reserve. In fact, I do not think this is strictly true, even as a first approximation. For one thing, the Fed operates with a reaction function that reflects the activities of the market. In addition, as the 2007-09 financial market crisis has emphatically demonstrated yet again, the Federal Reserve is required to serve as a lender-of-last-resort during financial crises. In such situations, the Fed's role is to shovel low-interest short-term credit to a distressed market. The latitude of the Fed to set the Federal Funds rate is thereby constrained by the regularity and extent of market distress.[5]

Nevertheless, to keep the discussion here focused, we will operate under the assumption that the Fed exogenously sets the Federal Funds rate. But even given this assumption, does it also imply that the Fed exogenously controls the full compliment of markets rates as well? In particular, can the Fed exogenously set the long-term rates that are most important for influencing investment and household mortgage borrowing? I pose this as a straightforward question own its own terms, without attempting to sift through the details of what one or another author—horizontalist, structuralist or otherwise—may have previously written on the matter.

To address this question, I present some simple empirical evidence regarding the movement of five market rates relative to the Federal Funds rate—two short term rates, the 6-Month Treasury Bond rate, and the bank prime rate; and three long-term rates, the 10-year Treasury Bond rate, the 30-year mortgage rate, and the Baa corporate bond rate. As we will see in considering this evidence, I think it is difficult to sustain an argument that the Federal Reserve can exogenously determine most of these market rates, the prime rate being the one exception.

Does such evidence contradict the horizontalist perspective? Again, I don't think there is much to gain from trying to interject such empirical findings as a reference point in debating horizontalist perspectives. This is because, in my view, horizontalists seriously waffle on this central matter of concern. For example, though, as quoted above, Rochon and Vernengo (2001) assert strongly in the main text of their introductory paper that "the rate of interest is exogenous; the monetary authorities set it," in the footnote accompanying this assertion they write, "If the rate of interest is exogenous, we are avoiding discussion of the determination of the spectrum of interest rates," (2001, p. 7). Moore (2001), also relegating this issue to a

[5] The idea that the Fed's first responsibility is as lender-of-last resort, and that this responsibility limited its ability to set interest rates, was argued forcefully by Minsky (1957).

footnote, offers only methodological generalities in his recent discussion on this question. He writes that "the statement that one can never empirically "prove" that a variable is completely exogenous is the same as that one can never empirically prove that a series is perfectly random. One can only attempt to refute the existence of particular regularities or patterns, that is, to test if the series is nonrandom. One can never prove that a series is patternless, but merely disprove that existence of a particular pattern," (2001, p. 29).[6]

Wray's 2006 paper, "When Are Interest Rates Exogenous" explicitly takes up the question of primary interest here. He also concludes that overnight rates are exogenously administered. But in my view, Wray is also unclear as to what this means for the determination of other rates. To what extent are they also administered? If other rates are not administered, how significant for the conduct of monetary and financial market policy is the fact that overnight rates are administered? Wray does takes pain to emphasize that the idea of administered overnight rates does not preclude "a role for Keynes's version of liquidity preference as a theory of asset prices, with liquidity preference as one of the components that goes into determining interest rates that are not administered by central bank policy." Wray also concludes that "none of this is inconsistent with Minsky's financial instability hypothesis according to which expansions and evolution in financial practices tend to stretch liquidity and create a fragile financial structure more vulnerable to financial crises," (p. 289). But the extent, significance, and idea itself of exogenously determined interest rates remains ambiguous.

None of these authors, or others in this stream of thought of whom I am aware, consider any empirical evidence in advancing their positions. Perhaps my simple empirical exercises here can help sharpen the discussion.

The second question I wish to consider concerns the policy implications that flow from the idea that the Federal Reserve's control over market rates is limited—that most market rates are determined with a high degree of endogeneity as an outcome of financial market operations. Some horizontalists seem to hold the position that allowing for the possibility of some significant degree of market interest rate endogeneity leads to a passive resignation before the powers of financial markets. Lavoie, for example, says that I have clung to a "media view" that markets exert influence over the Federal Funds rate (2005, p. 705).

This, of course, is not how I would characterize my own position, as expressed in previous work. Rather, my view is that if the Federal Reserve now operates with limited power to exogenously set interest rates via their control over the Federal Funds rate, the aim should therefore be to incorporate additional policy tools that can increase interest rate exogeneity. [7] The first consideration here needs to be financial market regulations, serving as a compliment to Central Bank interest rate policy. By definition, financial deregulation enhances

[6] Moore's equivocation here is similar to that in *Horizonalists and Verticalists*, which I pointed out in my 2001 paper.

[7] My 1991 and 1996 papers on endogenous money offered brief policy discussions that followed from the analytic arguments I advanced. Some of my earlier work exploring these policy implications in more depth include Pollin 1993 and 1995.

the autonomy of market forces and thereby weakens the Federal Reserve's power to exogenously set interest rates independent of market forces. Related to this is the issue of financial market instability. If markets are more unstable, then it is very likely that the risk premium built into market interest rates will increase. In short, to the extent that one believes central bank policy should operate as an effective exogenous force in financial markets, then we should take pains to assemble a set of policies that would enable a significant degree of interest rate exogeneity to become a reality. In this section of the paper, I briefly consider three types of policy interventions—securities transaction taxes, asset-based reserve requirements, and direct interest rate subsidies.

2. RELATIVE MOMENTS OF THE FEDERAL FUNDS AND MARKET RATES

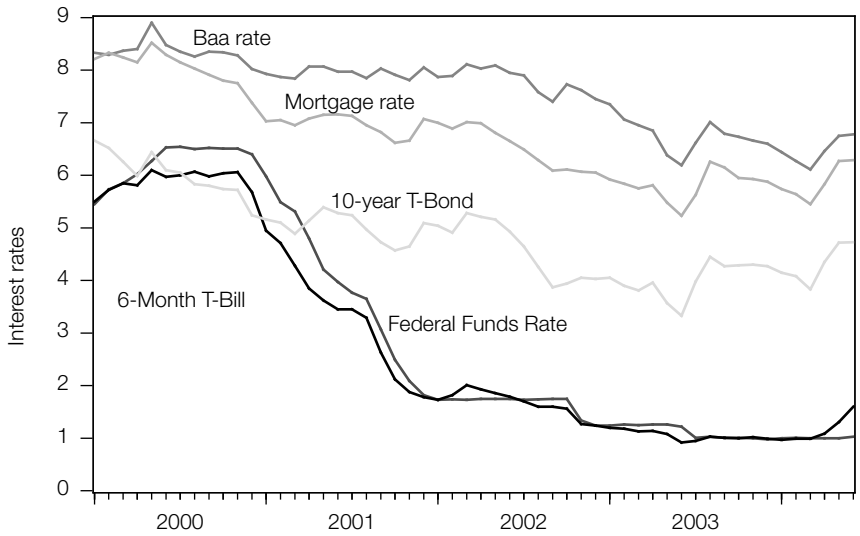
2.1. Federal Reserve policy interventions, 2000 – 04

We begin with a simple visual inspection of a crucial recent period in the conduct of U.S. monetary policy. This is the period when Alan Greenspan undertook an aggressive effort to fight an impending recession at the end of 2000, relying on large cuts in the Federal Funds rate as his primary policy tool.

As of June 2000, Greenspan had pushed the Federal Funds rate up to 6.5 percent, its highest level since January 1991. However, Greenspan had clearly then

Figure 1

Monetary Policy and Market Interest Rates



Source: Economagic.com. *Economic Time Series Page.*

misread the depth of instability in financial markets, the stock market in particular. As of December 2000, he began a long series of sharp cuts in the Federal Funds rate. We can see this in Figure 1, which plots the movements of the Federal Funds rate, along with those for 6-month T-bills, 10-year T-Bonds, 30-year mortgages, and Baa corporate bonds from January 2000 to June 2004.

The first Federal Funds cut from the 2000 peak came at the end of December. The average monthly figure for the Federal Funds rate fell in January 2001 from 6.4 to 6.0 percent. This was the first of a series of eleven cuts in the Federal Funds rate over the next year, through which the rate fell to a 40-year low of 1.73 by January 2002. Greenspan maintained the Federal Funds rate between 1.73-1.75 until November, at which put he cut the rate again, this time to 1.25 percent. In July 2003, Greenspan cut the Federal Funds rate to 1.00 percent, where it remained for a year. For the two-year period 2003-04, the Federal Fund rate was held at its lowest average recorded figure.

However, despite these highly aggressive moves by Greenspan, we see in Figure 1 that the impact was not consistent, and certainly not consistently strong, on market rates. The T-bill rate did track the downward movement of the Federal Funds rate step-by-step. But the 10-year T-bond rate fell much more modestly. In June, 2000, the T-Bond rate was at 6.00, lower than the Federal Funds rate at that point. By January 2002, the T-bond rate had fallen by less than one percentage point, to 5.04 percent. By June 2004, it was at 4.73 percent, 3.7 percentage points above the Federal Funds rate, the widest spread between these rates since July 1958.

The Baa and mortgage rates did also fall during the period of the Federal Funds rate cuts, but again, much more modestly. The mortgage rate was at 8.29 in June 2000, and was at 6.29 as of June 2004. The Baa rate was a 8.48 in June 2000 and at 6.78 in June 2004. In both of these cases as well, the spreads between the market rates and the Federal Funds rate were at peak or near peak levels.

Explaining why these virtually unprecedented spreads opened up between the Federal Funds rate and the longer-term market rates is beyond the scope of this discussion. Suffice it to say that, in observing this experience, it would be difficult to construe an argument that market rates were being set exogenously, as a fixed mark-up over the Federal Funds rate.[8]

2.2. **Fluctuations in interest-rate spreads**

We now consider another set of simple observations—the movement of interest rate spreads over a longer time period. In Table 1 and Figure 2, I present data on spreads of five rates—T-bills, prime, T-Bonds, mortgages, and Baa bonds—relative to the Federal Funds rate over the five most recent full business cycles. The data begin in November 1973, a cyclical peak month, according to the NBER

[8] The same patterns recurrent during the Federal Reserve efforts to counter the 2008-09 recession. Thus, Paul Krugman wrote the following in his *New York Times* column of 3/10/08: "One consequence of the crisis is that while the Fed has been cutting the interest rate it controls—the so-called Fed funds rate—the rates that matter most directly to the economy, including rates on mortgages and corporate bonds, have been rising. And that's sure to worsen the economic downturn."

Business Cycle Dating Committee. It proceeds until February 2008, just two months past the peak of the full cycle which began with the April 2001 downturn. Table 1 presents the figures in terms of means and standards deviations over the full five business cycles, while Figure 2 plots the full month-to-month time series for each of the interest rate spreads.

We begin with the summary statistics in Table 1. Considering first the two government paper rates—T-bills and T-bonds—the standard deviation of the spreads are larger than the means. This means that, within these five most recent business cycles at least, we clearly cannot know on a month-to-month basis what these interest-rate spreads are likely to be based on knowing the mean mark-up over the full period. Thus, with Treasury bonds, the mean spread is 0.98 percentage points. But the standard deviation is 1.84 percentage points. This is in a market where single digit differences in basis points—not full percentage points—affect the behavior of decisions of market participants. With the 30-year mortgage and Baa bond rates, the means, at 2.69 and 3.03 percent respectively, are only about 0.6 percentage points larger than the standard deviations. Thus again, in any given month, it would be reasonable to anticipate that the actual spread could be 2 or more percentage points off from the full-period mean values. The prime rate spread is the only case in which standard deviation is less than half the value of the mean spread of 2.33 percent.

Based on these descriptive figures, we clearly cannot establish with confidence, month-by-month, that we can know what the spread over the Federal Funds rate is likely to be.

This same general conclusion emerges through the visual inspection of the data plots for the full five cycles in Figure 2. One significant point that emerges from these plots that isn't clear from the summary statistics in Table 1 is with respect to the prime rate spread. With the prime rate spread, we do begin to see something

Table 1

U.S. Interest Rate Spreads:
Various Short- and Long-Term Rates minus Federal Funds Rate
(monthly data 1973.11 – 2008.02)

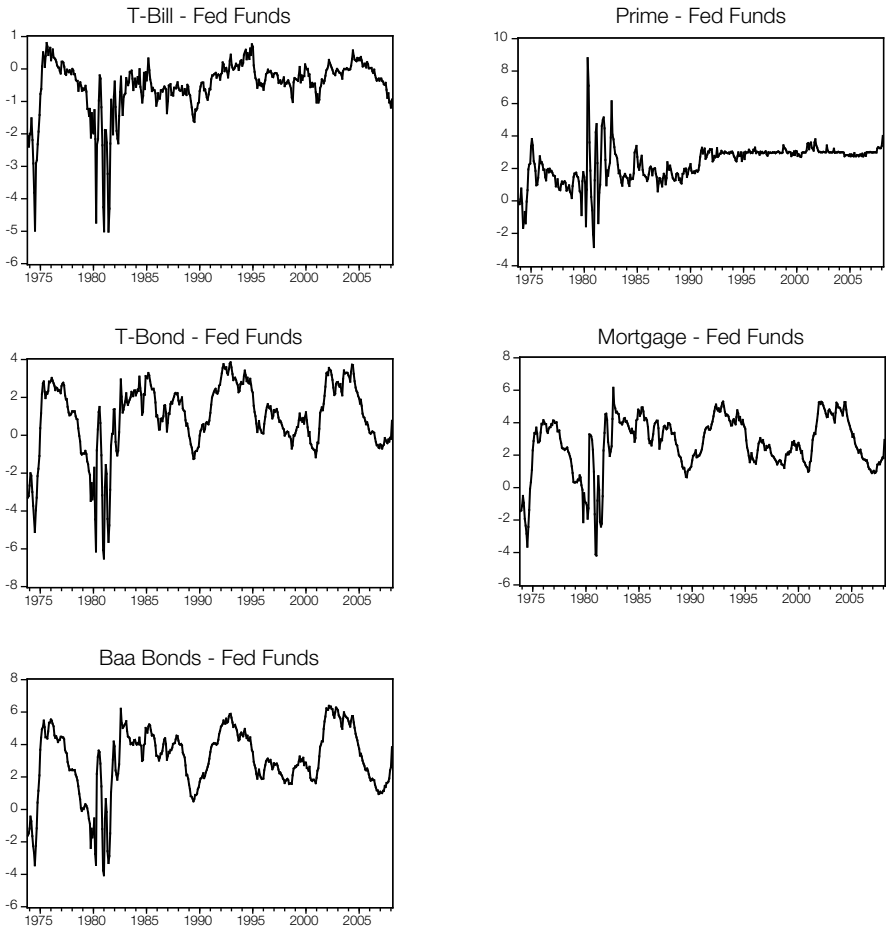
	Mean of Spread (percentage points)	Standard Deviation (percentage points)
T-Bill – Fed Funds	- 0.51	0.84
Prime – Fed Funds	2.33	1.16
T-Bond – Fed Funds	0.98	1.84
Mortgages – Fed Funds	2.69	1.74
Baa Bonds – Fed Funds	3.03	2.02

Source: Economagic.com.

close to a fixed spread over the Federal Funds rate beginning in the mid-1990s. Thus, from 1973.11 to 1994.12, the mean spread of prime over the Federal Funds rate was 1.90 percentage points, with a standard deviation of 1.29 percentage points. From 1995.01 to 2008.02, the mean spread was 3.01 percentage points while the standard deviation was down to 0.20 percentage points.

Table 2

U.S. Interest Rate Spreads:
Various Short-and Long-Term Rates minus Federal Funds Rate
(monthly data 1973.11-2008.02)



Source: Economagic.com. *Economic Time Series Page.*

Here again, it is beyond the focus of this paper to explain the shift commercial banks' operating procedures to have established their prime lending rate as a fixed mark up over the Federal Funds rate. For our purposes, the more important observation from these data is the contrast between the pattern with the prime relative to the spreads we see with the other market rates. With the prime since the mid-1990s, we see clearly how a fixed mark-up should proceed over time. The fact that none of the other market rates proceed at anything approximating the pattern with prime underscores with these other cases the evident and persistent volatility of the spreads over the Federal Funds rate.

2.3. **Granger-Causal relationships between the federal funds and market rates**

The third set of evidence I wish to introduce is a series of Granger causality tests, estimating the sequence of changes between the Federal Funds rate and the various market rates we have been examining.

I conducted a similar series of Granger tests in both my 1991 and 1996 papers. The basic question I addressed in both of these previous papers was this: can we observe that movements up or down in the Federal Funds rate consistently occur, as a sequence, prior to movements in the same direction of various market rates? The notion that market interest rates are determined exogenously by movements in the Federal Funds rate would certainly seem consistent with such a time sequencing—i.e. that the Federal Reserve acts to change the Federal Funds rate, and that this change in the Fed's monetary policy stance leads to subsequent, and broadly equivalent, changes in market rates.

In this paper, the Granger tests are modeled slightly differently than in my previous two papers, reflecting the small technical adjustments in the way the method has been specified more recently in the literature. In this case, the model is specified as follows:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \ldots + \alpha_i y_{t-i} + \\ + \beta_1 x_{t-1} + \ldots + \beta_i x_{t-i} + \varepsilon_t \qquad (1)$$

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \ldots + \alpha_i x_{t-i} + \\ + \beta_1 y_{t-1} + \ldots + \beta_i y_{t-i} + u_t \qquad (2)$$

where the y variable is the series of market rates, inserted one at a time, along with the Federal Funds, rate as the x variable. In equation 1 of this specification, we are estimating by how much the changes in the current value of a market rate can be explained by its own past values, then to see whether adding the lagged values of the Federal Funds rate can improve the explanation in the movement in the market rate. The market rate is said to be Granger-caused by the Federal Funds rate if the Federal Funds rate helps in the prediction of the current values of the market rate—that is, if the coefficients on the lagged values of the Federal Fund rate are statistically significant. In equation 2, we test for reverse causality—the extent to which lagged changes in the various market rates helps in the prediction of the current value of the Federal Funds rate.[9]

9 In my 1991 paper, I reviewed considerations as to why Granger-causality models might not offer a legitimate test of the interrelationships between the Federal Funds rate and the market rates. I argued then, and clearly continue to hold, that the Granger tests are informative in evaluating the extent to which the Federal Reserve exogenously determines market rates.

For the current set of tests, I am examining the Granger-causal relationships for the five market rates whose movements I have reported in the previous section—i.e. two short-term rates, the prime bank lending rate and the 6-month Treasury Bill rate; and three longer-term rates, the 10-year Treasury Bond rate, the 30-year mortgage rate, and the Baa corporate bond rate. I used 12-period lags, i.e. one full year of lagged values of both the Federal Funds rate and the various market rates. The variables are in first-difference form. As first differences, all variables are stationary.

The results of these tests are reported in Table 2. The figures in the table are F-statistics. I also show the p-value ranges associated with each of the F-statistics.

The results in the table are reported for three separate time periods: the full period 1973.11 – 2008.02; 2; the initial full business cycle, 1973.11 – 1981.06; and the most recent full business cycle, 2001.03 – 2008.02. In addition to considering the results for the full five cycles, focusing on the earliest and most recent cycles enables us to consider in a straightforward way the extent to which the Granger-causal relationships may changed over time.

Considering first the results from the full five business cycles, the most consistent finding is that there is mutual causality running between the Federal Funds rate and the five market rates. This is true both for the short- and long-term rates.

The prime bank lending rate is the one case where the degree of causation, as measured by the magnitude of the F-statistic, runs overwhelmingly from the Federal Funds rate to the prime rate. This result is consistent with the data plot we saw in Figure 2, where, from the mid-1990s onward, the prime rate was set as a virtually fixed mark up over the Federal Funds rate.

However, with the other four market rates, the F-statistics are of roughly the same magnitude, if not larger, when market rates are tested for Granger-causing the Federal Funds rate. In short, for the other four rates, there is no evidence suggesting a clear one-way line of causation running from the Federal Funds rate to the market. This conclusion is indeed underscored by the results that we see with the prime rate. With the prime rate alone, the dominant influence running from the Fed to the market emerges clearly from the Granger test results.

For the most part, these relationships for the full five business cycles also hold up during the earliest cycle, 1973.11 – 1981.06. It is only when we move to the most recent cycle, 2001.03 – 2008.02, that we find a departure from the patterns of the full five cycles. In considering the long-term market rates during this most recent cycle, there is no statistically significant Granger causation running from the Federal Funds rate to the market, and virtually none running from the market to the Federal Funds rate. These formal test findings are consistent with the data we have already seen over the period 2000.6 – 2004.6, when Greenspan pushed the Federal Funds rate from 6.54 to 1.0, then held it at this low level. As we saw then, the responsiveness of the long-term rates Greenspan's aggressive rate-cutting was weak.

These findings are somewhat different, though broadly consistent, with those reported in my previous two papers. Overall, in considering this most recent set of Granger-causality results along with those from my previous two papers, we can

Table 2

Granger-causality Tests between the Federal Funds Rate and Market Rates
Full period is 1973.11 – 2008.02
(5 full NBER Business Cycles; 413 observations)
Data are F-Statistics

	Five Full Cycles		First and Most Recent Cycles			
	1973.11 – 2008.02		1973.11 – 1981.06		2001.03 – 2008.02	
	Federal Funds rate "causes" market rates	Market rates "cause" Federal Funds rate	Federal Funds rate "causes" market ratesercado	Market rates "cause" Federal Funds rate	Federal Funds rate "causes" market rates	Market rates "cause" Federal Funds rate
Short-term rates						
6-month T-Bill	2.3[a]	10.1[a]	1.6[d]	4.4[a]	1.6[d]	5.9[a]
Bank prime	110.5[a]	5.3[a]	28.2[a]	4.2[a]	65.8[a]	0.1[d]
Long-term rates						
10-year T-Bond	3.1[a]	5.8[a]	1.7[c]	5.6[a]	0.6[d]	1.7[c]
30-year mortgage	5.0[a]	4.3[a]	7.4[a]	8.8[a]	0.6[d]	0.9[d]
Baa corporate bond	2.1[b]	3.6[a]	3.2[a]	6.0[a]	0.3[d]	0.7[d]

413 observaciones. Los datos son estadísticos-F
P-value ranges: a) < 1%; b) 1.1 – 5%; c) 5.1 – 10%; d) > 10%

Source: Economagic.com.

point to some robust findings. The most important is that the movements of the Federal Funds rate clearly do not Granger-cause movements in long-term market rates. In some periods, there does seem to be a significant level of two-way causation, but this is a less robust finding. Moreover, with the most recent cycle, we see evidence that whatever degree of causation that had existed in previous periods has broken down in the most recent cycle, to the point of insignificance.

In my previous two papers, I address at length alternative interpretations of this robust pattern of Granger-causality tests. n particular, I considered the view of some critics, as expressed by Moore, that these Granger results are actually supportive of an exogenous interest-rate view, since, as Moore put it, "long-term rates are based on market participants' estimates of future short-term rates," (1988, p. 286). Just to summarize briefly two key points:

1. No proponent of exogenous interest-rate theory has shown that long-term rates are set solely, or even predominantly, on the basis of market participants' anticipations of short-term rates. There is no doubt that expectations of Fed policy changes does influence the setting of long-term rates. But the available evidence also supports the view that other factors, including, in various combinations, liquidity preference, habitat preferences, and expectations about inflation, exchange rates, and market stability, also influence the movements of long-term relative to short-term rates. I return to this point below.

2. Even if we were to assume that market participants set long-term rates solely in anticipation of movements of short-term rates, there is still no reason to assume that participants in the long-term market operate with full, unfailing knowledge as to when, and by how much, short-term rates will move. To make this assumption is to abandon an analytic framework grounded in the principles of Keynesian uncertainty, and to enter a framework grounded in the principles of perfect foresight.

2.4. **Inflation and default risk**

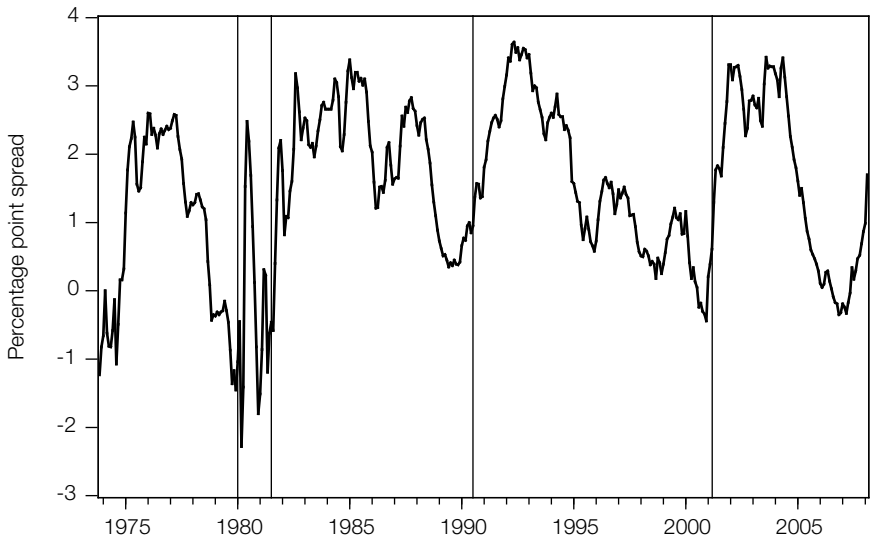
We now consider some standard measures of changes in inflation- and default-risk over time, i.e. as these are reflected in the movements of interest rate spreads.

Inflation risk. To measure inflation risk, we observe in Figure 3 the spread between the two government debt instruments we have been examining up to now, the 6-month Treasury Bill rate and the 10-year Treasury Bond rate. As U.S. government-issued debt instruments, they both carry no default risk. Thus, the movement in the spread between them will largely reflect the market's changed perceptions of inflation risk—with the long-term rate rising in relative terms to the extent that market participants believe accelerating inflation will erode over time the real value of the nominally-fixed returns derived from bonds.

The central point that emerges from Figure 3 is that perceptions of inflation risk are highly volatile over the full period, with the minimum spread at -2.28 percentage points in 1980.03 and the maximum spread at 3.64 percentage points in 1992.05—i.e. a difference between the minimum and

Figure 3

Inflation Risk Measure:
Spread between 10-year T-Bonds and 6-Month T-Bills
(Vertical lines are cyclical peak months)



Sources: Economagic.com; NBER.

maximum of nearly six full percentage points. The mean value for this inflation risk spread over the full period is 1.49 percentage points, and the standard deviation is nearly as large, at 1.22 percentage points.

Figure 3 is partitioned by vertical lines drawn at cyclical peak months over the full period. In dividing up the full period this way, it also becomes clear that inflation risk fluctuates broadly with the overall business cycle. During each business cycle expansion, the T-Bond rate rises relative to the T-Bill rate, indicating a rise in the market's perception of inflation risk as the cycle proceeds into its expansion and up to its mid-point. Moving past the cycle mid-point, perceptions of inflation risk start to decline and are generally low by the time the expansion is reaching its end-point.

While this is a broadly applicable pattern, we also see that the details vary from one cycle to the next. What is more generally evident from Figure 3 is that there is no roughly fixed level of inflation risk perceptions in financial markets, either over the course of individual business cycles or in moving over the longer term from one cycle to the next.

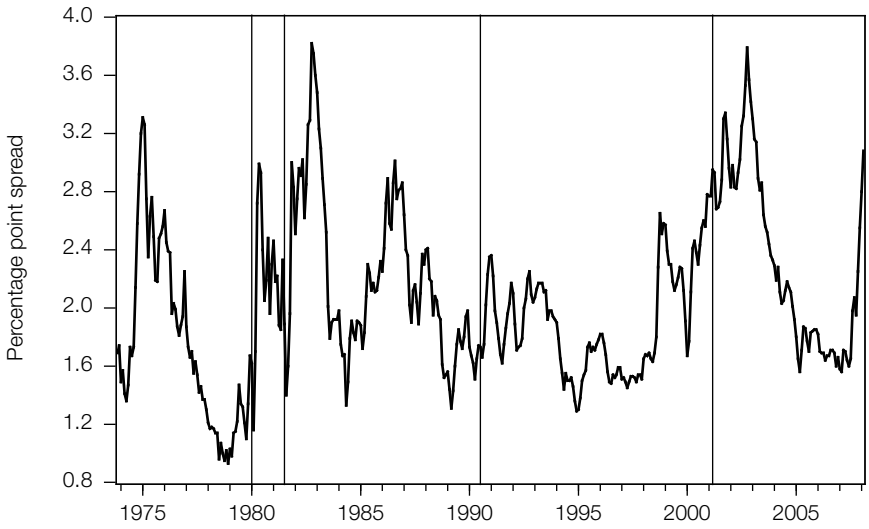
Default risk. To examine default risk, I plotted two sets of interest rate spreads—the spreads between the 10-year Treasury

Figure 4

Default Risk Measures

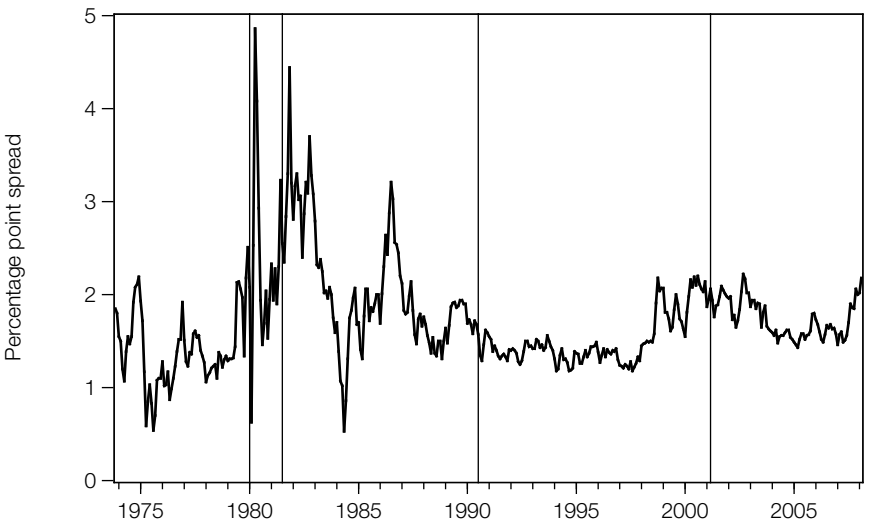
A) Spread between Baa Corporate Bonds and 10-year T-Bonds

(vertical lines are cyclical peak months



B) Spread between 30-year Mortgages and 10-year T-Bonds

(vertical lines are cyclical peak months)



Source: Economagic.com; NBER.

Bond rate and, respectively, the Baa corporate bond rate and the 30-year mortgage rate. These are both shown in Figure 4. With both spread measures, we are, of course, comparing the relative movements of a long-term government bond that is free of default risk with two debt instruments that are subject to default risk.

The first thing that is clear in observing these two data plots is how differently they behave. They proceed in broadly similar patterns through the mid-1980s. But thereafter the Baa spread becomes much more volatile. The Baa spread also follows distinct patterns through the two most recent cycles, rising to a peak of 3.79 percentage points in 2002.10, before falling sharply again in that cycle to 1.56 in 2007.02, then rising again by the end of the period, in 2008.02 to 3.08 percentage points.

The relatively mild fluctuations in the 30-year mortgage rate spread bear little relationship to the much more dramatic events that have occurred in the overall mortgage market over this period. These events include the collapse and bailout of the Savings & Loan industry in the late 1980s and early 1990s; and the housing market bubble and crash during the most recent full cycle. The crash of the housing bubble also lead to the subprime mortgage market crisis that is ongoing as of this writing. These events clearly were not incorporated into the default risk perceptions of those participating in at least the 30-year mortgage market.

To draw out some general points from Figures 3 and 4, I should emphasize again that our aim here is not to advance a theory of either inflation or default risk, or even to attempt a full specification of how to measure these phenomena. Rather the main points one can take from these simple descriptive observations relatively modest and straightforward: 1) spreads vary significantly over time, and that perceptions of risk are reflected in the ways these spreads fluctuate; 2) the spreads vary both within and between business cycles; and 3) spreads vary between financial market segments, such as the Baa corporate bond and mortgage markets.

To incorporate these observations within the overall issue at hand in this paper, it will be useful to pose this question: when the Federal Reserve adjusts the Federal Funds rate, can we reasonably predict what will happen at the same time with inflation risk and default risk? We have seen that inflation risk and default risk vary significantly over time and between market segments. As such, the link between Federal Reserve interventions to move the Federal Funds rate will not lead to predictable results with respect to longer-term market rates.

3. ESTABLISHING INTEREST RATE EXOGENEITY THROUGH REGULATION

As I emphasized in my 1991 and 1996 papers, a fully developed theory of money supply endogeneity needs to be embedded with a broader theory of systemic financial instability. This broader framework, in turn, will provide the foundation for establishing effective policy interventions to promote financial market stability and widely-shared access to affordable credit. This is also how the degree of interest rate exogeneity can be increased. Control over the Federal Funds rate, and equivalent short-term rates in other economies, are not capable on their own of serving this broader purpose.

The basic reasons why this is so flow readily from the Keynes/Minsky theory of systemic instability. The approach emphasized by Keynes and Minsky builds from a fundamental fact about the nature of capitalist economies: that the investment process—the basic activity which is a proximate determinate of an economy's level of income, employment and productivity growth—is unstable because it operates on the basis of uncertainty. As Keynes (1936) famously put it, "we simply do not know" how profitable a prospective investment project will be. A primary purpose of financial markets is to ameliorate problems due to uncertainty through increasing the liquidity of investments. When financial instruments are freely traded in relatively thick markets, illiquid investments in plant and equipment can be transformed into claims that are convertible into cash or other liquid assets as quickly as the institutional and technological structures permit. However, enhancing the liquidity of assets also tends to create serious problems for the stability of capitalist economies. An initial analysis of these sources of instability was presented forcefully in Keynes's *General Theory*. But this critical literature has of course developed widely since Keynes, including here Minksy's seminal contributions, along with many others in the Post Keynesian tradition.[10]

3.1. **Systems of Financial Regulation**

Overall then, according to these critical perspectives, thick but unregulated financial markets operate with substantial degrees of inefficiently and irrationally. This basic conclusion was the analytic foundation on which the post Depression and World War systems of financial regulations were constructed. These regulations included the Bretton Woods system of fixed exchange rates and related capital control measures, implemented at the level of domestic economies, to control international capital flows and speculative currency markets.[11] The Glass-Steagall system of domestic financial regulations was established in the United States. The main purpose of these regulations was to create barriers between various segments of the overall financial market, to limit the portfolio options for each market segment, and of course, most pertinent to our current focus, to regulate market interest rates.[12]

Even more extensive systems of domestic financial regulations operated in most European economies and Japan. Government regulations played a major role in determining both the cost of credit and the quantity of credit available for borrowers. In these "bank-based" systems, government regulators operated in close association with banks and nonfinancial businesses determining the cost of credit. The capital markets played a much more limited role in these economies in terms of mobilizing funds, allocating credit and influencing investment decisions.[13]

Focusing just on the role of central banks themselves, Epstein (2007) has recently

[10] The literature here is voluminous. Two collections of papers that build from Minsky's contributions include Fazzari and Papadimimitrou (1992) and Dymski and Pollin (1994).

[11] Panic (1995) provides a useful brief overview of the initial design of the Bretton Woods system.

[12] Essays in Dymski, Epstein and Pollin (1993) describe the structure and evolution of the Glass Steagall system.

[13] These financial structures are described in Zysman (1983), Pollin (1995), and Grabel (1997).

shown that throughout the history of what are now the most developed economies in the world, central banks utilized a wide range of policy tools to influence financial market activities, including the setting of market interest rates.

Virtually all central banks, including the Bank of England (BOE) and U.S. Federal Reserve (the Fed) have used direct means to support economic sectors. And this has not simply been a matter of historical aberration, but rather, it has been an essential aspect of their structures and behavior for decades on end. In particular, a crucial role for both the BOE and the Fed has been to promote the financial sectors of their economies, and especially, to support the international role of their financial services industries. They have done this by using subsidized interest rates, legal restrictions, directed credit and moral suasion to promote particular markets and institutions (2007, p. 97).

From this historical perspective, then, it is clear that Central Banks have been highly concerned with exogenously influencing interest rates and overall access to credit. They have not relied on any single policy instrument, such as the Federal Funds Rate, to achieve adequate levels of effectiveness in these interventions.

3.2. **Creating a viable regulatory framework in today's financial markets**

Three basic principles should guide the formulation of a new financial market regulatory regime today.[14] First, the regulatory environment should be consistent in the way that it affects all intermediaries and markets; in other words, following D'Arista and Schlesinger (1993), that policy engender an upward leveling of the regulatory environment. Such an approach minimizes opportunities for rent seeking through exploiting regulatory differences among market segments. A consistent regulatory structure is also easier to design, implement and enforce. The second principle is that, as much as possible, regulations should work through altering market prices and incentives rather than establishing hard limits on market activity. The third principle is the promotion of financial market activities in which social rates of return exceed private rates. The U.S. Glass-Steagall system, for example, heavily supported the social goal of financing of individual-family housing, through limiting the assets of savings and loan institutions to mortgage loans.

This is not to say that determining social rates of return is always straightforward. But one clear choice would be to weight heavily the benefits accruing through financial stability itself. Thus, any new regulatory environment should seek to limit the immediate sources of instability—herd behavior, the contagion effects of market trends, and the spillover effects from financial market activity to the broader economy.

Two specific policy measures that are consistent with all three of these broad principles are *asset-based reserve requirements* and *security transaction excise taxes*. Asset-based reserve requirements would include Basel-type capital adequacy requirements, margin requirements on stock trading, and requirements limiting the composition of loans, such as had applied to

14 See Pollin (2009) for a full, if less technical discussion on these themes.

savings and loans under the Glass Steagall system. When they operate properly, such measures enable regulators to establish differential carrying costs to financial institutions according to the quality of the assets in their portfolio. Thus, if financial market stability is the social outcome sought by such measures, then loans from regulated intermediaries that finance speculative trading would carry higher reserve or margin requirements. The same technique is capable of promoting other goals as well, as was the case under Glass-Steagall with individual-family housing.

Securities transaction excise taxes, such as the so-called "Tobin tax" on foreign exchange markets, are an efficient way of raising the costs of short-term speculative trading in financial markets, as opposed to trading for the purpose of long-term asset holding. Following the principle that regulations should be consistent across market segments, the tax should be imposed not simply on foreign exchange markets, as with Tobin's initial proposal, but consistently across all markets.

The idea of the tax is that it allows the market to screen out speculative from more stable financial flows. This is because a small tax on a security transaction--for example a 0.5 percent tax on a equity trades--would create a negligible burden on asset owners who intend to hold their asset for the long-term. However, if asset owners purchase a new stock with the intention of selling it at a profit in the short-term, the 0.5 percent tax would be imposed on each trade, and would thus constitute a significant burden.

Proposals for these taxes have faced substantial criticism in recent years, in particular around the point that imposing them necessarily creates serious market distortions and thereby new opportunities for rent-seeking. But in fact, such measures can be implemented in a workable fashion across financial market segments.[15]

3.3. **Loan guarantees and interest-rate subsidies**

A final, and most direct, approach to injecting exogeneity into market interest rates would be to have explicitly rates administered by government policy. This is, of course, by no means a far-fetched idea. Indeed, as I emphasized earlier and has been recently discussed in the Epstein paper cited above, interest rate ceilings and other forms of direct credit subsidies had been standard practice both in the U.S. and elsewhere before financial markets were deregulated and central banks shifted their operating procedures in favor of indirect policy interventions. Moreover, as noted above, bank-based financial systems operated with administered interest rates, establishing subsidized rates to channel credit to activities that were consistent with a government's industrial policy goals.

One way to introduce subsidized interest rates that flexibly incorporates lender-based assessments of risk and evaluations of collateral would be for government policy to offer explicit loan guarantees, with the costs of credit to borrowers declining in proportion

[15] Pollin, Baker and Schaberg (2003) surveys the literature on securities transaction taxes and offers a design proposal that would allow the tax to operate neutrally across segments of the financial services industry. Feige (2005) offers interesting ideas on broadening transaction taxes to include all asset markets and relying on asset transaction taxes as a substitute for income taxes.

to the degree to which the loan guarantees removed risk from private sector lenders.[16]

Under such an arrangement, the guarantees could be targeted at market segments that reflect social priorities. For example, as I write now amid the mortgage market meltdown in the first half of 2008, one obvious priority would be to restore a stable market for affordable home mortgages, in particular for first-time home buyers. A loan guarantee system for this market segment could be constructed roughly in terms of the following considerations.

At its peak in 2006, total mortgage lending was at roughly $1.1 trillion. Of this amount, roughly 15 percent, or $170 billion, was for home purchases for first-time home buyers. Under the credit subsidy program, the U.S. government would therefore underwrite the fully $170 billion in mortgages for first-time homebuyers. For purposes of illustration, let's allow that the government underwrites a total of $200 billion in loans. We also assume that the level of guarantee is 50 percent of the principal on these loans. Deep into the market crisis at the end of 2007, the default rate on mortgage loans was 0.83 percent. For the purposes of our exercise, let's assume a default rate more than five times as large, of 5 percent.[17]

We therefore operate with three assumptions:

1. The government loan guarantee program assumes $200 billion in contingent liabilities to underwrite the first-time homebuyer mortgage market.
2. The default rate on these loans is 5 percent.
3. The guarantee on these loans covers 50 percent of principal.

Under these three assumptions, it follows that the accruals to the government would amount to $5 billion/year (i.e. $200 billion x 0.05 x .50). This figure would of course represent a significant commitment by the government. Still, with the federal budget now at $2.8 trillion, this loan guarantee program would amount to less than 0.2 percent of total federal spending. This, again, is while making implausibly large assumptions about the scope of the program and about the default rate on mortgages.

The next step in developing such a program would be to establish an appropriate subsidized interest rate on these loans. The starting point is the long-term government bond rate, since these operate with no default risk, though, like long-term mortgages, they do incorporate inflation risk. The default risk on a subsidized mortgage would then depend on 1) the credit profile of the individual borrower; and 2) the extent of the loan guarantee. Based on this, the rate on concessionary loans should be set as an increment above the government bond rate. How large an increment above the government bond rate should then depend on the borrower's profile and on the extent of the government guarantee on loans.

To make this clearer, we can stipulate that a government bond faces zero default risk. Thus, the interest rate on a private loan with a 100 percent guarantee should be set

[16] My co-authors and I have recently considered similar policy interventions in the context of the South African and Kenyan economies in Pollin et al. (2007, 2008) and Pollin (2008).

[17] Data in this paragraph are from the Federal Reserve Board *Flow of Funds Accounts* and T2 Partners LLC, "Why We Are Still in the Early Innings of the Bursting of the Housing and Credit Bubbles," March 16, 2008, www.valueinvestingcongress.com.

at exactly the government bond rate. By contrast, the appropriate rate on a loan with no guarantee is, by definition, the market interest rate on the loan. As such, the government bond rate and the market interest rate define the range within with concessionary rates should be set.

The appropriate concessionary rate can therefore be derived simply as follows:

$i^{lg} = i^m - LC$, where

$LC = C(i^m - i^b)$,

and i^{lg} is the rate on loan guarantees, i^m is the market interest rate for a loan of a given risk class and maturity, C is the percentage of a loan that the government is guaranteeing, and i^b is the government bond rate for a given maturity.

To illustrate this calculation with an example, consider a case, based on actual market conditions in January 2008. At that time, the 30-year mortgage market rate was 5.76 percent and the 10-year Treasury Bond rate was 3.74, a spread of 2.02 percentage points. Under the arrangement above, the subsidized rate on mortgages would fall by 1 percentage point, to 4.76. If one would want the subsidized rate to fall more, then we would increase the extent of the loan subsidy. With a 75 percent guarantee, the subsidized mortgage rate would be 4.25 percent.

Under such a system of loan guarantees and subsidized interest rates, private lenders would still be bearing significant risks and would therefore have strong incentives to carefully evaluate loan applications. Moreover, such a system still operates with strong market incentives: private lenders would still be bearing significant risks and would therefore have strong incentives to carefully evaluate loan applications.

Obviously, this is a very limited exploration on ways to establish a large-scale system of loan guarantees. To make such a proposal workable would entail considerable development in terms of monitoring and creating disincentives for fraud. It would also entail much more detailed work in appropriately defining the market segment that would be eligible for subsidies and the appropriate level of subsidy.

The simple point I am trying to underscore with this exercise is about the types of interventions that are needed to exogenously control interest rates. Far greater degrees of interest rate exogeneity can be attained relative to current conditions. But this cannot be accomplished if we insist that, to achieve interest rate exogeneity, it is sufficient to rely only on the Federal Reserve's ability to set the Federal Funds Rate.

4. **CONCLUSION**

The contributions of Post Keynesian economists on the theory of money supply endogeneity—including the important initial work of Kaldor, Minsky, Davidson, Moore, and Rousseaus—have been considerable. To begin with, as monetarism and allied approaches rose to professional hegemony in the early 1970s, the Post Keynesian theorists presented the first sustained challenges to this view.

Orthodox economists have now largely abandoned the main tenets of the quantity theory, at least in terms of policy practice, if not theoretical foundations. At present,

inflation targeting remains the dominant policy framework, though now without a coherent theory comparable to the quantity theory to guide policy practice.

Meanwhile, Post Keynesians have made significant strides in advancing positive theoretical ideas and policy approaches. Such analytic efforts—to the extent they are conducted rigorously—inevitably uncover weak features of the approach. If not corrected, these weaknesses in turn lead to a stagnant research agenda and inadequate policy prescriptions, just as was the case with the quantity theory.

The debate among Post Keynesians on the nature of money supply endogeneity is now roughly two decades long. From this vantage point, it appears that many of the main topics for debate have not been resolved, and are not likely to become resolved as long as the debate proceeds as it has to date. Part of the reason for this is that the questions that tend to be asked are too broad and therefore difficult to pin down.

I have tried in this paper to concentrate attention on one specific question—the degree to which market interest rates are determined exogenously. Horizontalists have held strongly to the idea that "the interest rate" is determined exogenously by central banks. Building from my reading of the structuralist approach, I have argued by contrast that market forces are a major force—and are in most cases the major determinant—of market interest rates, especially at the long end of the markets. I have also held that there are clear reasons for this endogeneity—in particular, the ongoing systemic instability of financial markets in capitalist economies, which lead market participants to made wide swings in their risk assessments over time.

The problem of unstable financial markets arises from the fact that the inherent instability of markets becomes more severe when markets are permitted to operate under weak regulatory regimes. The movement toward financial market deregulation since the 1970s has therefore meant a movement toward increased interest rate endogeneity. It follows that effective regulatory policies to stabilize markets and control interest rates directly will increase the degree of interest rate exogeneity.

The importance of this question couldn't be more clear in light of the ongoing financial crisis. Projecting forward a positive research agenda, I would hope that a growing large number of researchers will take up the challenge to better understand the possibilities for increasing the degree of interest rate exogeneity, in the U.S. economy and elsewhere.

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