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### **ABSTRACT**

One of the most significant changes in monetary economics in recent years has been the virtual disappearance of what was once a dominant focus on money, and in parallel the disappearance of the LM curve as part of the analytical framework that economists use to think about issues of monetary policy. Today's standard workhorse model consists of an aggregate demand (or IS) curve and an aggregate supply (or price setting) curve, with the system closed when appropriate by an equation that represents monetary policy by relating the nominal interest rate to variables like output and inflation, but typically not either the quantity or the growth rate of money.

This change in the standard analytics is an understandable reflection of how most central banks now make monetary policy: by setting a short-term nominal interest rate, with little if any explicit role for "money." But the disappearance of the LM curve has also left two lacunae in how economists think about monetary policy. Without the LM curve it is more difficult to take into account how the functioning of the banking system, and with it the credit markets more generally, matter for monetary policy. Abandoning the role of money and the analytics of the LM curve also leaves open the underlying question of how the central bank manages to fix the chosen interest rate in the first place.

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**THE LM CURVE: A NOT-SO-FOND FAREWELL**

**Remarks in Honor of Charles Freedman**

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Celebrating the distinguished career and prolific contributions of a researcher and policymaker like Chuck Freedman gives us occasion to take stock. Chuck's experience at the center of Canadian monetary policy has spanned more than three decades. His professional interest in the field, dating to the beginning of his post-graduate studies at Oxford, spans four. Along the way, he has participated in just about every aspect of the evolution that has taken place in monetary economics and monetary policymaking. He has more than earned his place in the front rank of those whose views one would want to seek out on any issue in the field. And both his own country's government and the economics profession at large have made a habit of doing just that.

Monetary policymaking is different today than it was four or even three decades ago, and so is monetary economics. More specifically, the focus of attention has shifted in important ways. During the five years that Chuck Freedman attended MIT, the Journal of Political Economy published 29 articles on the demand for money: not quite one per issue. During the

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<sup>1</sup>Remarks presented at the Bank of Canada conference in honor of Charles Freedman, Ottawa, June 19, 2003.

most recent five years, the total number of articles on money demand in the JPE has been three. The leading graduate textbook in the field when Chuck was in graduate school was Money, Interest and Prices, by Don Patinkin. The book's title immediately suggested what was to come. Patinkin introduced the concept of money demand in the book's second chapter (it didn't fit in Chapter I, "The Theory of a Barter Economy"), and the word "money" appeared in the title of each of the next six chapters. The construction and manipulation of what Patinkin called the LL curve -- his analog to the Hicksian LM curve in his neoclassical setting in which what varied was not output but prices -- was a central focus of the entire second half of the book, designated "Macroeconomics." By contrast, the text in use in many graduate courses today is David Romer's Macroeconomic Theory. Not only does the book's title contain no mention of either "money" or "monetary," the Romer text has no chapter title with those words either. The demand for money makes only two substantive appearances, both fleeting. The LM curve occupies less than a page.

More importantly, in parallel to what the allocation of journal and textbook pages suggests, a shift has visibly taken place in the analytical framework that economists concerned with monetary policy (to continue to call it that) use to address fundamental research questions as well as everyday issues of practical policymaking. A widely read and widely assigned article in the Journal of Economic Literature several years ago — "The Science of Monetary Policy" by Richard Clarida, Jordi Gali and Mark Gertler — presented in canonical form what has become the standard workhorse of the field: a two-equation model consisting of an aggregate demand (or IS) curve, relating today's output level to expected future output and the expected real interest

rate;<sup>2</sup> and an aggregate supply (or short-run Phillips) curve relating today's inflation rate both to today's level of output, relative to some capacity benchmark, and to expected future inflation.

What is striking about this two-equation workhorse model is not so much what's in it — forward-looking behavior by both price setters and demanders of goods and services, rational expectations, and so on — but what's missing. There is no LM curve. And there is no variable labeled “money” either. To close the model with an equation representing the behavior of monetary policy, Clarida, Gali and Gertler added a “Taylor rule” relating the nominal interest rate to output and inflation (but, again, neither the quantity nor the growth rate of money).

A traditional question about any scientific discipline is the balance of influence, between internal intellectual dynamics and the external environment, in shaping the evolution of ideas in the field: Does creative thinking evolve primarily in an axiomatic way -- that is, because so-and-so's hypothesis opened the path for somebody else to think such-and-such? Or does new thinking arise mostly in response to tension between the implications of existing thinking and what everyone can readily observe in the world around them?

Monetary economics, or macroeconomics, has always displayed a large element of influence due to the external environment. The subject emerged as a recognizable field within economics in response to the upheavals caused by the depression of the 1930s. The concepts of aggregate demand, unused resources, price stickiness and market disequilibrium that grew out of that experience -- all with a focus on a short-term horizon in which familiar dynamics did not fully play themselves out -- became the central supports of the discipline for the next four

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<sup>2</sup>Clarida, Gali and Gertler were careful to note that the form of the aggregate demand relationship they present does not exactly correspond to an IS curve, but the difference is not essential.

decades. Then the inflation of the 1970s, importantly including the disinflation of the 1980s, reshaped the field in yet new ways. Aggregate supply, inflation expectations and money growth became (or, in some cases, became again) essential concepts, and the time horizon within which various dynamics did work themselves through returned into view. And, of course, the force of ongoing economic events affected not just what conceptual constructs were central to the field but what people thought about the key substantive questions in it: Does monetary policy affect output and other aspects of real economic activity? How costly is disinflation? Can monetary and fiscal policies operate fully independently?

The LM curve, representing the equilibrium of money demand and money supply — or equivalently, for many purposes, the solved-out money market-goods market system expressed in the form of a relation between aggregate demand and the money stock — was a staple of macroeconomic analysis of both the 1930s vintage and the 1970s vintage. It was the starting point for thinking about how a central bank, by changing the supply of (outside) money, could influence prices or output or both. In the case in which the central bank instead fixed an interest rate, by supplying money perfectly elastically, the LM curve per se became trivially horizontal, but the underlying supply-demand apparatus still importantly indicated how much money households and firms in the economy would choose to hold at the designated interest rate.

This remains the way much of macroeconomics is taught to undergraduates. The latest (2003) edition of Greg Mankiw's Macroeconomics includes a full presentation of the LM curve as one of the two building blocks of the determination of aggregate demand, and in particular the point of entry for thinking about monetary policy. But the model laid out by Clarida, Gali and Gertler, with only the aggregate demand/IS curve to go along with the aggregate supply/price

setting curve, has now become the starting point for much of the familiar research in the field. Moreover, it is, in summary form, increasingly what policy-oriented discussions within central banks look like. A generation ago, even as the rational expectations revolution spawned a burgeoning line of academic research based on intertemporal optimizing models with explicit microfoundations, the everyday conversation within central banks continued to be based, sometimes explicitly but much more often in substance, on the logic of an IS curve intersecting an LM curve. Today the IS curve has survived, but the LM is gone.

What makes the disappearance of the LM curve (and, in parallel, the disappearance of interest in the demand for money) so unusual in the evolution of macroeconomic thinking is that, unlike the sea changes that occurred after the 1930s and the 1970s, this intellectual shift has been a product not of events in the economy but of changes in policymaking practice. If central banks still made monetary policy by fixing the level or growth rate of some measure of outside money — bank reserves, the monetary base, or some equivalent — it is hard to imagine that researchers and students in the field would have dropped the LM curve from their analysis. But in recent years few if any central banks have either formulated or implemented their policy in that way.

Even now that central banks make policy by fixing an interest rate, if they did so with the near-term objective of steering some measure of (inside) money growth along a designated target path — as many used to do a couple of decades ago — the LM curve and the representation of money demand standing behind it would still be central to policy analysis. But nowadays most central banks don't do that either. As a result, neither the LM curve nor even the concept of money demand any longer has much bearing on what we continue to call monetary policy. Perhaps in time the generic name for this form of economic policy will change as well. (In the

vocabulary used within the Federal Reserve Bank of New York when I worked there as a student intern, at the same time Chuck Freedman was studying at MIT, the purpose of the Federal Open Market Committee was to take decisions on “credit policy.”)

It is difficult today to see how the LM curve will re-establish itself in the economics of monetary policymaking — unless, of course, central banks go back to making policy in terms of target rates for money growth. This is not a loss to be lamented. Even so, the disappearance of the LM curve leaves two other lacunae that in time may prove more a matter of concern. First, the disappearance of the LM curve has made it more difficult to take into account the functioning of the banking system within standard macroeconomic analysis of monetary policy. The LM curve immediately brought one side of the banks’ balance sheet into the picture: their liabilities. From there, it was straight forward that (except for changes in bank capital, which are usually small in the short run) whatever happened to total liabilities also had to track the fluctuation in total assets. And this link opened the way to bring into the analysis the full range of theoretical work on the supply and demand for credit, as well as the flow of information from lending institutions that most central banks normally monitor. With no LM curve, and no explicit role for the demand for money, integrating the credit markets into both the theoretical and the practical analysis of monetary policy is going to be harder. In short, no deposits, no credit.

Second, dropping the LM curve, in recognition that most central banks make monetary policy not by fixing outside money or targeting inside money but instead by fixing some interest rate, leaves open the underlying question of how the central bank manages to fix the chosen interest rate in the first place. This is a subject that Chuck and I, along with Charles Goodhart and Mike Woodford, have debated before, and this occasion is not the right time to revisit that

argument. For present purposes, what is interesting is that one of the key phenomena under discussion in that debate is the fact that in recent years central banks — including those that fix the relevant short-term interest rate by some kind of “channel” system, as well as others, like the Federal Reserve, that do not — are able to move market interest rates by means of transactions that are negligibly small in magnitude, and often without engaging in any transactions at all. Whatever the explanation may be, it seems very far away from the traditional story in which an open market operation either increases or decreases the quantity of outside money, thereby shifting the LM curve while the demand for money remains functionally stable.

What should we think, with the benefit of hindsight, about the role that the LM curve played in thinking about monetary policy over so many decades? Was it just a distraction? Or a valuable construct whose usefulness was overtaken by changes in how policymakers go about their business? And does anyone now regret those changes in policymaking? Or seek to reverse them?

With or without the LM curve, confidence in the efficacy of monetary policy has rarely been higher.<sup>3</sup> The chronic inflation of three decades ago now seems a distant memory. The power of that historical episode to motivate useful new research in the field is dissipating, just as the hold exerted by the depression gradually waned in the face of the mostly full-employment post-war economy. Some countries conquered their inflation in part by changing their monetary policymaking institutions. Importantly, however, others succeeded against inflation with no institutional change, or changed their mode of policymaking only after inflation had already

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<sup>3</sup>The exception that proves the rule is Japan. The Japanese case serves as a reminder that wrong-headed monetary policy can also influence real economic outcomes, and seriously so.

abated. It is no longer a commonplace to think that monetary policy, when made by central banks not subject to some kind of external straightjacket, is subject to unavoidable inflationary biases.

Just as important, no central banker makes policy today as if his or her actions had no effect on real economic outcomes. Moreover, today no central banker feels the need to be apologetic about believing that monetary policy does affect real outcomes. Bob Lucas' famous "critique" of macroeconomic policymaking appeared shortly after Chuck first joined the Bank of Canada, and the playing out of that line of thought has been a major part of the evolution within the field ever since. More than a quarter-century later, there is active research questioning all three of the basic underpinnings of the "new classical" demonstration of the neutrality of systematic monetary policy: flexible wages and prices (the assumption on which economists who rejected monetary neutrality focused attention almost immediately), the "natural rate" model of aggregate supply, and, most recently, even the rationality of expectations. As Chris Sims tellingly wrote in the latest issue of the Brookings Papers, in a study of the use of traditional macroeconometric models within central banks, "The FRBUS model is seldom used in its 'model-consistent expectations' mode. Most uses of the model are for monetary policy, and with a horizon of up to two years or so. In this time frame it is not reasonable to suppose that the public would quickly perceive and act on a shift in policy behavior."<sup>4</sup> Today, most economists would probably agree with Chris' statement. But this is exactly what was at issue in the original claim that monetary policy could not affect real outcomes because changes in expectations would undo the behavior that such models implied.

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<sup>4</sup>BPEA, No. 2, 2002, p. 33.

The difficult challenge, in the new world of monetary policy with no LM curve and no substantial role for money demand, will be to understand the relationships between what individual households and firms and banks and asset management firms do — rearranging their portfolios, making and taking loans, buying and selling equities and perhaps foreign currencies, investing in physical assets, buying and selling real goods and services, hiring and selling labor, and setting prices and wages, all in ways that somehow depend in part on the interest rates that central banks set — and the observable influence of monetary policy on such features of the aggregate economy as output and employment and inflation. In many respects, this task is simply a part of the broader integration of microeconomics and macroeconomics that has been on the profession’s agenda for decades.

Economists often aspire to make our discipline more like physics. (Joel Cohen once accused social scientists more generally of “physics-envy.”) Just as there are today two “economicses” — micro and macro, referring to the behavior of individual agents and aggregate economies, respectively — there are also two “physicses”: quantum theory, which describes the behavior of the tiniest particles of matter, and Newtonian mechanics (as amended by the theory of relativity), which applies to far larger bodies. One of the challenges that physicists face is to integrate the two. As the distinguished mathematician Roger Penrose has pointed out, however, the way to do so is clearly not simply to take the principles of quantum theory and apply them wholesale to larger bodies. Doing so leads, in Penrose’s classic example, to concluding that a basketball can be in two places at once. An important part of what we have learned about monetary policy during the years spanned by Chuck Freedman’s professional career is that simply applying to aggregate economies what we know about the behavior of rational, profit- or

utility-maximizing individual agents similarly leads to patent contradictions of the behavior of the economic world in which we live.

The field of monetary economics has made impressive progress over the years that Chuck Freedman has been a part of it, and the fact that we have not yet fully met this daunting challenge in no way diminishes the progress we have made. One of history's great moralists (Chuck will immediately recognize the words of the second-century sage R. Tarphon) explained, "You are not required to finish the task; but neither are you free to neglect it altogether."<sup>5</sup> None of us has finished the task taken up by monetary economics. Chuck Freedman has certainly never neglected it.

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<sup>5</sup>Avot 2:16.