THE 'PURE SCIENCE' APPROACH TO ECONOMICS AND MONETARY POLICY

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ABSTRACT

Perceptions of money do influence monetary policy, and monetary policy does have an impact on the functioning of the economy. For instance, a high interest rate policy usually entails high levels of bankruptcies and unemployment. Also, given a loss of confidence in the issuing authority (monetary dislocation), paper money can and does fail in all its functions as a medium of exchange, a unit of account, and a store of nominal value. In a money economy in which nominal money is the medium of exchange, nominal money prices reflect the underlying exchange ratios of the various commodities that are produced and exchanged for nominal money. In the absence of monetary dislocation (monetary revaluation or devaluation), any change in the nominal price of a commodity reflects a change in its purchasing power (a change in its exchange ratio vis-a-vis other commodities). Monetary policy prescriptions, which ignore this reality, result in significant displacement costs to members of society. A 'pure science' approach to economic research engenders policy prescriptions based upon assumptions of the economic system which are not aligned with the empirical reality. Hence, to avoid severe social costs, the 'pure science' approach to economics needs to be modified to deal with social reality.

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INTRODUCTION

This paper focuses on the 'pure science' approach to economic theorizing, whereby the inherent or underlying assumptions of the mathematical models employed dominate or displace empirical reality. While the discipline of economics has benefited immensely (gained new insights) from experimentation and model building due to the 'pure science' approach, policy recommendations and performance measurements, in particular monetary policy decisions, have been adversely influenced by that approach. The concerns presented herein are shared by Blaug [1992], Mayer [1993], and O'Donnell [1992]. Blaug stresses the need for economic theorists to accept the fact that: (1) "...economic theories must sooner or later be confronted with empirical evidence as the final arbiter of truth ..." [1992,xii]; and (2) "if economists are going to take a stand on questions of economic policy, not to mention advising governments what to do, they must have knowledge of how the economic system functions..." [1992,xxii]. Mayer [1993] is concerned with the inordinate amount of effort expended in 'pure science' type of research. O'Donnell [1992] focuses on the consequences of policy decisions based on advice given to policymakers by 'pure science' economists. In

this scenario, "[t]he core concepts of economic theory are frequently presented as mere definitional postulates of the theory, rather than assertions about the nature of economic reality, and their arbitrary nature is defended as irrelevant given their role as assumptions. These definitional postulates or assumptions form the basis of logical-mathematical relations which . . . generate observation-statements" [O'Donnell 1992,78].

This paper is a discourse limited to the manner in which the monetarists' model (which is a specific example of the 'pure science' approach) affects applied policy decisions. Given the premises of monetarism, the policy implication is *the acceptance of unemployment and bankruptcies as necessary costs for the maintenance of a certain level of prices* [Fuhrer and Moore 1995]. While the implemented policy can hardly be expected to solve the problem, it can possibly exacerbate an aggravated situation. Hence, monetary policy based upon the flawed quantity theory of money can disrupt the functioning of the economic system. This issue is of utmost importance to all members of society and is of special significance to those whose employment opportunities can and are often affected by prescribed policy.

The experienced contraction or expansion of economic activities in most developed economies is a function of consumption and production decisions which are heavily influenced by *prescribed monetary policy* (i.e., an administered interest rate policy). For economic policy to be effective, economic policy prescription must be related to the empirical reality; in which case, reference has to be made to the actions of individuals and organizations and the consequences of those actions. As noted by Rogerson [1997,86]: "There is apparently a great deal of confusion between getting more precise specifications of one particular ad hoc rule for monetary policy and getting better understanding of what constitutes good monetary policy. I do not see how the issue of understanding what constitutes good monetary policy is related to getting smaller standard errors on the estimated coefficients of a regression of changes in inflation on unemployment."

ECONOMICS AND EMPIRICAL REALITY

Pythagoreans "are credited with having divorced mathematics from practical ends, that is, with having transformed it from a practical ends, as it was ..., into a liberal art." Essentially, Pythagorean mathematics "rest upon a curious view of number which warns us that their doctrine existed for its originators in a mental context" [Farrington 1969,30]. Later

mathematicians have created a totally independent world [Farrington 1969,30] which has its place, but to scorn the practical side of mathematics is to deny the purpose of its first creation [Newsom 1964,117]. Similar to mathematics (geometry emerged for the purpose of surveying), economics emerged as an empirical science and not as a 'pure science'. Economics draws its substance from empirical observations, yet many *economic policy decisions* are based upon economic theorizing which treats economics as a 'pure' instead of an 'empirical' science. Just as mathematicians have divorced mathematics from its empirical beginning so have some economists divorced economics from its empirical beginnings. The strict adherence to the formalism of mathematics is a clear indication that economics is treated as a 'pure science'.

Undeniably mathematics is a powerful analytic tool and there is a significant role for mathematics in economics. However, it is inescapable that when mathematics is viewed as formal logic, only relationships matter; there is no room for empirical reality. The government in general depends upon economists for guidance on monetary and fiscal policies. For a policy to be effective it has to be grounded in economic theory that explains or describes the empirical reality. Policy prescriptions for society derived from mathematical models that are devoid of empirical reality can be productive only by sheer coincidence; in many instances they may prove to be counterproductive.

POLICY PRESCRIPTION

The purpose of economic analysis is to enable an understanding of the behavior of individuals in an exchange setting and the effect of business, government, and philanthropic decisions on the economy. Information obtained from this analysis provides a basis for governmental policy prescription. A good description or explanation of behavior and the existing conditions provides a sound basis for the prediction or projection of possible future states. Given the description or explanation, prediction then is based not upon past conditions but upon economic conditions and behavior which are expected to prevail in the future. In this setting, epistemological relevance has dominance over mathematical elegance.

Mathematicians can be excused for engaging in a purely formal exercise shunning empirical realities; however, since governmental policy is heavily influenced by economic analysis, there is no justification for the exclusion of empirical reality from economic analysis which is aimed at policy prescription. However, though influenced by political

forces, prior policy makers at the Federal Reserve, in their quest to trash inflation, may have been more influenced by mathematical elegance of models relating to M1 and M2 than by epistemological relevance.

The trade-off accepted by the U.S. government, implicit in the directive by the U.S. Congress [1975,1194] to maintain the long-run growth of monetary and credit aggregates consistent with the economy's long-run potential to increase output, has been less inflation at the expense of more unemployment [Solomon 1982,191-193]. Consistent with the directive, the Federal Reserve had set out to control the growth rate of the money supply at around 5.8% for the period 1975-1985; however, the actual growth for that period was 8% [Rasche and Johannes 1987,185-186].

The Federal Reserve essentially targeted the federal funds interest rate during the entire 1967-1997 period. After greatly broadening the federal funds target range in 1979, the Federal Reserve maintained a restrictive monetary policy for an extended period to combat entrenched changes in the general level of prices and the general price level declined precipitously [Thomas 1999,142-143]. However, the mathematical model did not conform to the economic reality. Owing to the erratic behavior of the velocity of M1, the US shifted away from M1 as an intermediate target in February 1984 to measures of *performance of the domestic economy* [Melton and Roley 1990,78]. Since then, the Federal Reserve has abandoned the dominant role for monetary aggregates in monetary policy--a zero weight is assigned to monetary aggregates [Blinder 1998,29].

Since output failed to recover from the recession during 1990-1991, the Federal Reserve dropped its federal funds target [Thomas 1999,143]. The current focus for the Federal Reserve is on business expansion, inflationary pressures, and developments in foreign-exchange markets [Melton and Roley 1990,67]. Furthermore, in recent years, there is much concern as to what weight should be placed on asset prices in wake of the booming activities in the financial markets [Greenspan 1999].

THE PURE SCIENCE APPROACH

In geometry, Euclid made a distinction between "axioms" and "postulates," but modern mathematicians consider these two terms synonymous and use either term to designate all the assumed propositions of a logical discourse [Eves and Newsom 1965,94]. Likewise, the

followers of a 'pure science' of economics are not concerned with what is: self-evident (axiom), provable to be true (postulate), and a formal condition (assumption) of a system. By treating all of these as the same, the system is formalized whereby empirical reality has no role.

The economic system has a tendency toward equilibrium (equilibrium-seeking) but is in a continuous state of dynamic disequilibrium. Under the 'pure science' approach, the assumptions of "general equilibrium of markets" and "neutrality of money" lead to the conclusion that money is simply superimposed on a system of exchange which is in equilibrium and the quantity of money in circulation buys the output of the system. That is, the money in circulation exchanges regularly and repeatedly for the physical output in which case the money value of the output is distributed as money income which underwrites the purchases of the output. This depiction of the quantity theory is to be found in Mill [1857 (1929),493-494]. In this setting any increase in the money in circulation can only affect a change in the general price level. Of necessity (another assumption), velocity is held constant.

In the monetarist literature, it is argued that the level of the nominal money supply is accountable for inflation. To combat the effect of rising prices, an interest rate policy is prescribed (i.e., raising or lowering interest rates mainly through the discount rate and open market operations [FRBSF 01/01/1999]). Implementation of this policy results in the contraction of the economy; and because of the ensuing unemployment with its consequent loss of purchasing power, prices tend to fall briefly. The temporary fall in prices gives the impression that the interest rate approach to combating rising prices is working, but then prices continues to rise. The continuous rise in prices is due to the credit policies administered by businesses and bank lending practices. Businesses extend the duration of payment on installment purchases and financial institutions lengthen the time for loan repayment on consumer loans (e.g., see Consumer Bankers Association [1995]). Hence, unemployment continues while prices continue to rise. Additional doses of the interest rate medicine produce yet more instances of temporary price stabilization.[1] As described above [Thomas 1999], this stabilization effect of the interest rate policy is considered as evidence that the changes in level of the money supply is accountable for the changes in the general level of prices; hence, the quantity theory of money is valid. The illusion continues.

Mathematical elegance as an end in itself is the driving force in economic research.

For purposes of model building, assumptions can be made with impunity; but when it comes to policy formulation involving jobs and bankruptcy costs, empirical relevance for monetary policy--a proper understanding of the structure of the economy--is essential. Accordingly, a discussion of the impact of the 'pure' science approach as embodied in instrumentalism on policy prescription follows.

INSTRUMENTALISM

David Hilbert maintained that mathematics is a meaningless game, which is played with meaningless marks on paper [Bell 1951,38]. Hilbert introduced formalism as a methodology in which assumptions, axioms, and postulates are considered as interchangeable. Ever since, most modern mathematicians hold the view that mathematics is concerned with playing a game according to a given set of rules. Given this view, it is imperative that non-mathematicians enquire into the 'truth of mathematical propositions' [Bell 1951,23]. While the relational terrain of mathematics is well defined for the purposes of mathematical investigations, in scientific investigations the deployment of mathematics as an effective tool relies on an intellectual effort which is external to mathematics for critical specification [Schwartz 1962,356-357].

Friedman [1953,14] maintained that: "... the relation between the significance of a theory and the 'realism' of its assumptions is almost the opposite. ... Truly important and significant hypotheses will be found to have 'assumptions' that are wildly inaccurate descriptive representations of reality, and, in general, the more significant the theory, the more unrealistic the assumptions ... ." Popper [1959,59 Footnote*1] maintained that 'instrumentalism' "is the view that a theory is *nothing but* a tool or an instrument for prediction." Further on Popper [1959,423] stated that he labeled the view "that abstract theories are not genuine assertions about the world, . . . they are nothing but instruments--instruments for the prediction of observable phenomena." Friedman's Positivism [1953] can reasonably be identified as a version of 'instrumentalism' as defined by Popper [1959].

Boland [1979] has defended Friedman on the grounds that Friedman is adhering to an instrumentalist epistemology; that is, prediction, and not explanation, is all that is needed for policy prescription. The impropriety of such a position has been recognized in early debates. For instance, the mathematical astronomy of Ptolemy had been set aside as of no relevance,

although its *predictive ability* had proven to be far more successful than the astronomy of Aristotle. Since the physical astronomy of Aristotle provided a better explanation of the working of the cosmos than Ptolemy's, it was considered superior to Ptolemy's astronomy [McMullin 1967,13].

Falsity of axioms appears in the scientific literature *in context* of the fact that the *axioms for entirely different systems* (e.g., Euclidean versus non-Euclidean systems) *are invariably false for each other* [Pledge 1966,189; Flew 1989,426-427]. Friedman cannot be denied the right to take an opposite view to the perceived reality, but when the evidence based upon his own model design fails to support his theory it is difficult for policy makers to justify the continued adherence to that position--monetarism.

ORIGINS OF THE PURE SCIENCE APPROACH TO ECONOMICS

Adam Smith used the universal law of gravity (the "law of the invisible chain" [Evensky 1989,124,142] developed by Isaac Newton in physics to arrive at the "law of the invisible hand." Smith's [1967,65] fascination with Newton's scientific achievement enabled him to be convinced of Bernard de Mandeville's [1732] natural law principle of individual selfishness. Mandeville, a fervent advocate of laissez faire, (in various editions, 1714 to 1732) had explained in great detail the role of unimpeded self-interest in generating the greatest benefit to society. Recognizing the similarity of Newton's mechanics to Mandeville's view on human actions (each person, unimpeded by any social constraint, following his or her natural impulse--own selfish interest--would produce results that appear to be guided by some force [Mandeville/Kaye (1732) 1924,cxl]), Smith drew a parallel between political economy and natural science.

Walras [1926,69-70] followed through with Smith's ambitious idea and attempted to ascribe to economics the features of the natural sciences (physics in particular) and made the exaggerated claims that value in exchange (nominal money price) is: (1) a "natural phenomenon"--natural in its origin, manifestations and essence, (2) comparable to the law of gravity, and (3) a branch of mathematics (which has been neglected and left undeveloped by mathematicians). It must be noted that the comparison of economics with a natural science is invalid. While human beings cannot alter the planetary motions, they can certainly change their economic behavior. The significance of this latter point is that the planets are

programmed to behave in a predetermined manner, whereas human beings are not internally programmed to act in a predetermined manner. In essence, the objects of physics have no emotions; therefore, they cannot and do not react to emotional stimuli.

The purpose of experimentation is to enable society to cope with reality; therefore, reality must not be denied. Experimentation is always needed; on such grounds, one can justify Walras' strenuous emphasis that a pure science of economics needed to be developed:

> Following . . . [the same procedure of the mathematical sciences] . . . the pure theory of economics ought to take over from experience certain type concepts, like those of exchange, supply, demand, market, capital, income, productive services and products. From these real-type concepts the pure science of economics should then abstract and define ideal-type concepts in terms of which it carries on its reasoning. The *return to reality* should not take place until the science is completed and then only with a view to practical applications. Thus in an ideal market we have ideal prices which stand in an exact relation to an ideal demand and supply [Walras 1926,71]. (*Emphasis added*.)

However, when the results from certain experiments are continually refuted, they should not be subject to the sunk cost fallacy and be continued. Instead new searches or experiments on the problem(s) should be undertaken.

It is important to note that Walras was following in the path of the natural sciences, astronomy in particular. It is noted that Kepler and Galileo did use abstraction, but merely as a means of analysis; after the analysis they developed their theories not in terms of their abstractions but in context of the real world--reality. Johann Kepler recognized that mathematical elegance had to bow to reality. It was only by reverting to the reality of the observations of Tycho Brahe was Kepler able to arrive at the empirical laws of planetary orbit [Pledge 1966,38-39; Drake 1973,20]. Similarly, Galileo recognized that in reality friction affected falling objects. In order to understand how objects fall, abstraction (the removal of friction) by Galileo was necessary to get a better understanding of reality. The abstraction enabled reconciliation between Galileo's theory and fact. However, both astronomers did not substitute abstraction (a world in which friction does not exist) for reality (a world in which friction exists). In economics, unlike in astronomy, after the elegant mathematical economic model was developed by Walras, it was accepted and continues to be accepted as reality by many economists in spite of Walras' own concern for the "return to reality."

THE QUANTITY THEORY OF MONEY: A 'PURE SCIENCE' MODEL

In great part, owing to rigidities in the economic system the price of a particular commodity is an exogenous variable and not an endogenous variable; however, in those instances, where the price is endogenous, the dynamic adjustment is reflected in output: physical quantities are adjusted [Kawasaki et al 1982,998-1000]. The monetarists position, that only changes in M (money supply) produce changes in the price level, is grounded tautologically in the quantity theory which holds that "the nominal money supply at time t is the nominal value of all assets" [Sargent 1982,1219]. It is held postulated that "the value of money and the price level are synonymous, or more correctly, correlative ideas" [Wicksell 1935,129]. Therefore by definition, any change in the price level would constitute a change in the value of money. Consistent with this reasoning, Friedman [1980,254-255] maintained that inflation (wherever its presence happens to be observed) is a monetary phenomenon. This view of money, as the value counterpart of assets, permits the calculation of constant real balances; it establishes "perfect proportionality between money and the price level" [Sargent 1982,1219]. The monetarists argue for causation from M (nominal money) $\rightarrow$Y (nominal income). Yet, "[h]istorically, M has lagged behind Y at turning points [in the business cycle]. Crude cause and effect would then lead to the inference that Y is the cause and M effect. But those who want to reverse the direction of causation can always take foolish comfort in the fact that the rate of growth of M, dM/dt, will for a quasi-sinusoidal fluctuation turn down one-quarter cycle before M itself--and thus the causal sequence dM/dt$\rightarrow$Y may help save the appearances" [Samuelson 1965,103].

In a very sanguine assessment of Friedman's work, Clower [1971/1984,118] maintained that: "Since the monetarist school has not provided an explicit formal account of the dynamics of monetary adjustment, . . . the bulk of monetarist literature . . . [is] so much sound and fury, signifying little more than the personal charm, dialectical skill and encyclopaedic factual knowledge of its chief apostle, Milton Friedman. The monetarist literature is important--and highly so--for the questions it forces us to ask about observed patterns of behaviour; but it is worth almost nothing as far as the answers to these questions, or guidance in seeking answers, is concerned."

Evidence for twenty countries for a period of about eight years contradicted Friedman's

hypothesis [Fellner et al. 1964,13]. Meltzer [1977, 201-202] concluded that: "if maintained inflation is defined as the average rate of price change, the results deny that inflation has been entirely a response to growth in money." In addition, Laidler [1989,1157] stated:

> The data on the timing of cyclical turning points in various U.S. time series, which Friedman first drew to our attention in 1958 (reprinted 1969), are extremely suggestive, but the simple fact remains that a further 30 years of monetarists analysis has not been able to demonstrate the empirical existence of a structurally stable transmission mechanism between money and inflation to the satisfaction of its own practitioners, let alone its critics. ... Monetarists in search of support for the case that money is more a causing than a caused variable often turn to the analysis of extreme experiences.

While substantial empirical evidence challenge the relationship between the growth rate of the money supply and rate of change of the price level [Smith 1985a,532-533, 535,542-543;1985b,1193-1196], nevertheless policy prescription has continued to be based on the monetarist model. During the 1960s through the 1980s, monetary policy of most western governments were shaped by the prescriptions of the monetarist school of thought. In almost all countries, the central banks invariably use interest *rate-control* to implement monetary policy. There are two distinct roles for the central bank's discount rate in monetary policy: (1) the alteration of the interest rate and the supply of money - an interest rate targeting approach, and (2) the alteration of expectations in financial markets concerning the direction of monetary policy by means of announcements - a reserves targeting approach [Sellon 1982,85-89].

Except for Switzerland, the focal point for monetary policy is the money market [Poole 1990,38]. Both the Federal Reserve Board and the Bank of Japan use an interest-rate-focused monetary policy, for example; however, while the U.S. uses M2 and M3 as working definitions of money (prior to 1987 it was only M1), Japan's definition is M2 plus CDs [Grivoyannis 1991,140]. However, it is statistical goodness of fit of economic data and not explanation of economic events that has prolonged the continued adherence to the monetarist school of thought. For instance, to bolster the cause of the quantity theory, Lucas [1996,665] draws upon a study based on data from 1960-1990 by McCandless and Weber [1995,7, Table 1], who report a simple correlation between inflation (defined as “changes in a measure of consumer prices”) and money growth of .96 if M1 is used and .92 if M0 (the monetary base)

is used. Lucas [1996,666], maintains that the quantity theory of money "applies, with remarkable success, to co-movements in money and prices generated in complicated, real-world circumstances."

With the further major contradictions of the monetarist model in the late 1980s, Benjamin Friedman [1990,70-71] stated that "[t]he simple correlation between money growth and inflation . . . calculated in the form often recommended by Milton Friedman, although statistically significant, is now significantly negative. One can only wonder what, other than a tautology, is left of the notion that inflation is 'always and everywhere a monetary phenomenon'." Yet, instrumentalism which had been the basis for policy prescription was not shaken. The natural rate of unemployment, one feature of the monetarist school, continues to enjoy a foothold in monetary policy models. This situation reflects the continuing of an ongoing trend.

In *The History of Astronomy*, Smith revealed his overwhelming admiration for Sir Isaac Newton [Smith 1967,65]. His fascination with Newton's scientific achievement enabled him to overcome all consideration for empirical reality as revealed in Hobbes' [1651] remarkable exposition on human nature. Smith [1776, Book IV, Chap. II] was more convinced of the natural law principle of individual selfishness which was expounded by Mandeville [1732] with such eloquence in unequivocal terms:

> . . . [Should one] examine into the Nature of Man, . . . [one] may observe that what renders him a Sociable Animal, consists not in his desire of Company, Good-nature, Pity, Affability, and other Graces of a fair Outside; but that his vilest and most hateful Qualities are the most necessary Accomplishments to fit him for the largest and, according to the World, the happiest and most flourishing Societies. [Mandeville (1732)1924,Preface,p.4]

It is maintained that Smith in later life fully realized the failure of "the Invisible Hand" *as a functional reality* and he was merely advocating an "ideal" system and not explaining the empirical reality; yet many economists have adopted him as the patron saint of the free market paradigm and hold steadfastly to that belief [Evensky 1989,143].

Nevertheless, the field of astronomy does provide an insight into how reality should take precedence over mathematical elegance. While Copernicus relied upon mathematics and deduction, it was Tycho Brahe's vast amount of accurate observations which enabled

Johann Kepler to formulate the empirical laws of planetary orbit--the planetary theory as is known today [Pledge 1966,38-39]. The accurate observations of Brahe were at variance with every philosophical, astronomical, and *mathematical tradition of the past*. This fact forced Kepler to introduce ellipses into the heavens in place of Copernicus' circles [Drake 1973,20]. *Copernicus was concerned with mathematical elegance*. It must be understood that "Kepler's Copernicanism was no less guided by the desire to discover the physics of the heavens than his sober demand for precise mathematical fit between actual observations and the theory he proclaimed concerning the architecture of the universe" [Drake 1973,23]. Just as the metaphysical implications of the new astronomy and new physics were at odds with the Aristotelian and Ptolemaic views [Finocchiaro 1989,26], so to is the empirical reality on price level changes at odds with Friedman's and the monetarists' views.

THE SERVICE FUNCTION OF MONEY

Historically, in all the major inflationary situations, the monetarist view obtains only when there is a loss of confidence which brings about a repudiation of paper money. The loss of confidence, a "crisis of doubt" (Bresciani-Turroni 1937,172), leads to an increase in the velocity of circulation. In 1923, the use of foreign currency prevented Germany from being completely transformed into a barter economy. Recently, the "crisis of doubt" resulting in the dislocation of the domestic currency was experienced in Russia, where the U.S. dollar is the preferred means of saving [Vasiliev 1994,134].

Nominal money has a service function; however, conditions can materialize which may preclude it from fulfilling that function. In that case, the system will find a nominal money substitute (or in the worst scenario some other means) for conducting exchanges. A government, within its domain (the domestic economy), can destroy the capacity of the money which it mints if it fails to demonstrate its credibility. This condition was experienced in Germany (1919-1923) whereby the mark was replaced with foreign currencies: "[f]irst in foreign trade, then in internal wholesale trade, and later in retail trade" [Bresciani-Turroni 1937,173]. Russia (1991-1993) provides a more recent example of the flight from the domestic currency (the ruble) into foreign exchange [Sachs and Woo 1994,127]. (The international exchange rates is not at issue here; thus, the exchange rate mechanism in international currency markets is not being discussed.)

In each case, the government is operating on its credit worthiness; if its credit is destroyed then there will be a deliberate desire to dispose of that government's money units for any readily-available storable goods. The evidence reveals that, in the second half of 1919, a loss of confidence in--the abandonment of--the German mark had begun; by 1923, it was repudiated [Bresciani-Turroni 1937,172,174]. Similarly, in January 1991, the declaration by the Soviet government that the 50- and 100-ruble notes were null and void led to the flight from the ruble into commodities. The subsequent announcement by the Soviet government in June 1991, that consumer prices would be raised in 1992, resulted in a further loss of confidence precipitating a further flight from the ruble into commodities and foreign exchange [Sachs and Woo 1994,127]. *In the absence of such a condition,* while changing demand and supply conditions for goods and services will produce different general price levels, nominal money will not lose value over time.

PURCHASING POWER AND NOMINAL MONEY: THE REALITY AND ITS EXPRESSION

The change in the general price level (stated as change in the *value of money*) has been viewed by some economists as some sort of economic wave carried by *purchasing power*. If the purchasing power theory implied by the quantity theory of money is correct, then purchasing power represents an unchanging absolute value, to which the rate of change in the price level should be directly related. The foregoing reasoning leads to a trap, since one cannot measure the value of price level change to disprove the purchasing power theory as follows. (1) Almost all methods of measuring price level changes involves units of money (price signals) in buying and selling transactions, so the price level change actually measured is an average change for prices in this dynamic process. (2) Purchasing power resides in goods and services that satisfy human needs. Purchasing power of a commodity is not a constant; it is a relative value based upon the intensity of desire (psychologically induced) and institutional forces (e.g., union strength in pay increases and technological changes) acting upon each and every commodity.

According to Galbraith [1997,106]: “the measure of scientific maturity lies in a willingness to match theory with evidence, to discuss anomalies with an open mind, and to move on when it is appropriate to do so. Occasionally, this may mean reconstructing one’s thinking from the ground up.” As argued earlier, it is the net effect of the realignment (of the

prices of commodities) that produces the change in the price level. Depending on the weights assigned to the various commodities used in constructing the general price index, it may be found that the general price level has gone up, or down or even remained unchanged. This price level index, which is based upon a basket of goods and services, may be useful for comparing the change in what may be called a "barometric" pressure of the economy, but it certainly is not a measure of the loss in the value of money.

The purchasing power uncertainty is an identifiable attribute of nominal money (a specified and unequivocal nominal value) which permits transactors to accrue information over time, by processing signal information generated by nominal money prices. According to Blaug [1992,141: "The constant-real-income formulation of demand curves is . . . an evasion of issues: the income effect of a price change is an integral part of the real-world consumer behavior as is the substitution effect and to leave it out is to adjust the world to fit our theories rather than the other way around."

SUMMARY AND CONCLUSION

Purchasing power resides in commodities and is the end result of the dynamic process of the interaction of psychological and technological forces. Along with the social evolutionary process, existing economic systems have not evolved into systems of "general purchasing power exchange", instead they have evolved into systems of "monetary exchange" in which paper money is accumulated as a means of storing nominal value. Changes in the general price level are causally conditioned by a number of factors, which are extraneous to money as an agent for organizing economic activities through its service functions--liquidity (readiness to exchange) and signaling (measurement of the relative values of commodities and reflecting through price the relative scarcity and abundance of one commodity and the other). Current mathematical modeling views purchasing power as a constant value and nominal money as a changing value. The empirical reality is the reverse.

The analysis in this research paper reveals that persistent changes in the general level of prices is caused by the realignment of the exchange ratios among the various commodities. Thus, the pure science approach to monetary policy as a means to fight inflation--to eliminate, or at least minimize, persistent changes in the general level of prices--fails because it lacks empirical realism. It is based upon assumptions that are invalidated

by empirical evidence, which reveal that the persistent changes in the general level of prices cannot be attributed to the level of the money supply.

ENDNOTE

1 For the history of changes in the Federal Reserve discount rates (from 11/16/14 to 12/13/01), see Federal Reserve Bank of Minneapolis. http://minneapolisfed.org/economy/bankdir/disc.html.

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