Working Paper 75-2

INTEREST RATES, EXPECTATIONS, AND THE

WICKSELLIAN POLICY RULE

Thomas M. Humphrey

Federal Reserve Bank of Richmond

July 1975

INTEREST RATES, EXPECTATIONS, AND THE
WICKSELLIAN POLICY RULE

Prominent among older theories of inflation is the view that a

rising price level stems from a divergence between two rates of interest.

One, the market rate, is the loan rate charged by banks. The other is the

natural rate of interest defined as the rate that would equate the demand

for real capital, as determined by the productivity of capital, and the

supply of real capital, determined by the volume of current saving. First

enunciated by Henry Thornton in 1802, and developed more fully by Knut

Wicksell at the end of the century, the two-rate doctrine was endorsed by

such leading 20th century monetary theorists as Keynes, Robertson, Ohlin,

Myrdal, Hayek, and von Mises. It was a key element in many widely held

theories of the business cycle in the 1920's and early 1930's. Moreover,

it became the basis of the celebrated policy rule that the central bank

could make its greatest contribution to price stability by striving to keep

the market rate in line with the natural rate.

The two-rate doctrine has been overshadowed by rival theories in

recent years, however. Current explanations of inflation tend to stress

other causes, including excessive money stock growth, wage-cost push

pressures, monopoly pricing policies, labor-capital immobilities, and

special (random) factors peculiar to each inflationary episode.

What accounts for the relative neglect of the two-rate doctrine?[1]

One reason, perhaps, is that Wicksell's version of it gives inadequate

---

[1]The two-rate doctrine has not been totally ignored, of course,
as indicated by several recent articles that employ the Wicksellian analyt-
ical framework. At least two studies [Horwich (1968) and Tanner (1975)]
attempt to estimate the natural rate of interest and to evaluate Federal

treatment to the role of inflationary expectations, generally considered to be a vital ingredient in the inflationary process. Correction of this shortcoming would enhance the contemporary relevancy of the doctrine, making it more applicable to current policy problems. Accordingly, the main purpose of this article is to incorporate inflationary expectations into the two-rate analysis and to indicate how this modification alters the Wicksellian policy prescription.[2]

The article proceeds in the following manner. The first section contains a brief review of the historical development of the doctrine up to Knut Wicksell. The second summarizes Wicksell's contribution, including his analysis of the cumulative process and his policy prescriptions. Section three shows what happens when inflationary expectations are injected into Wicksell's model. Section four uses the revised Wicksellian model to interpret recent inflationary experience.

Reserve policy against the norm of Wicksell's ideal policy rule. Another study [Harrington (1971] uses Wicksell's two-rate doctrine to account for the post-war growth of the volume of money substitutes and to deal with a number of controversial issues including: the exogeneity vs. endogeneity of money, the effectiveness of a policy rule fixing the growth rate of the money stock, the reliability of the money stock or its growth rate as policy indicators, and the desirability of having banks pay competitive interest on demand deposits. Still other studies [e.g., Lutz (1974) and Sargent (1969)] attempt to incorporate inflationary expectations into Wicksell's model and show how it modifies the condition of monetary equilibrium. Not all of this research is policy oriented, of course. For example, one recent study [Laidler (1972)] contends that Wicksell's theory of the cumulative process contains most of the key elements of the Clower-Leijonhufvud reinterpretation of the "the economics of Keynes" as a theory of disequilibrium dynamics.

[2]Lutz (1974) also attempts to incorporate expectations into Wicksell's model, but does not analyze the policy implications in any detail.

I. HISTORICAL EVOLUTION OF THE TWO-RATE DOCTRINE

Henry Thorton

In his classic The Paper Credit of Great Britain (1802), Henry Thorton provided the first rigorous and systematic analysis of the relation between interest rates and inflation. His contribution consists of four elements.

First, he distinguished between the market or loan rate of interest and the expected yield or marginal rate of profit on new capital projects. He stressed that the two rates were separate and distinct phenomena, the first being a money rate determined in the market for loanable funds and the second a real rate determined in the commodity market by the supply of saving and the investment demand for new capital. This distinction between the two types of interest rates marks an advance over the views of his predecessors and contemporaries, many of whom regarded the loan rate as simply the shadow or monetary expression of the yield on real capital.

Second, he was the first to express the doctrine that inflation results from a divergence between the two rates. He described in great detail how such a disparity would set in motion a process of cumulative expansion in the demand for and supply of loans, the note issue of banks, and the level of prices. He pointed out that this process would persist for as long as the loan rate remained below the commercial profit rate.

Third, he used his two-rate schema to analyze the inflationary consequences of a central bank policy of pegging the rate of interest. He argued that if the Bank of England were constrained by usury laws to a ceiling loan rate of 5% at a time when the mercantile rate of profit was in excess of 5%, it would lose control over the volume of its loans and its note issue, both of which would expand indefinitely, producing

inflation. With the rate pegged, inflation could continue without limit because there existed no automatic corrective mechanism to bring it to an end. This reasoning constituted the basis of his criticism both of the usury laws and of the Bank of England's practice of adhering to a fixed discount rate. He maintained that the central bank should control the note issue by keeping its discount rate in line with the rate of profit. He was thus the first to advocate use of the discount instrument to regulate the money supply. And if the usury ceiling should threaten to interfere with the operation of discount rate policy, then, he argued, the central bank should resort to other forms of credit-rationing to limit its loans. The essential thing was that the bank keep a firm grip on the monetary circulation and control the note issue.

Finally, Thorton was the first economist to discuss the effect of inflationary expectations on market interest rates, describing how the anticipated rate of inflation becomes incorporated into the nominal rate of interest causing the latter to rise above the real or price-deflated rate. Thus Thorton must be credited with originating two separate theories of the relationship between interest and prices, the first stressing the effect of interest rates on inflation and the second emphasizing the reverse impact of inflation on interest rates.

The Classical Economists

Although Thornton was the first economist to clearly express the doctrine that inflation results from a divergence between the profit rate on capital and the loan rate of interest, that doctrine is usually identified with Knut Wicksell, the great Swedish economist who independently reformulated it almost 100 years later. Not until Wicksell's meticulous

and systematic exposition of the theory and its policy implications did
it become thoroughly established in the mainstream of monetary analysis.
It is true that earlier in the 19th century certain elements of Thorton's
analysis had been employed by some leading British classical economists,
notably David Ricardo and John Stuart Mill, to explain how an injection of
bank money influences spending and prices indirectly through the interest
rate channel. Using the two-rate doctrine, these writers explained how
bank money enters the system initially via an expansion in the supply of
bank loans, the latter tending to reduce the loan rate temporarily below
the profit rate on capital, thereby stimulating investment spending and
exerting upward pressure on prices. For the most part, however, classical
economists tended to minimize the significance of the two-rate mechanism.
They argued that money exerts a much stronger influence on prices through
the direct expenditure channel than through the indirect interest rate
channel. They claimed that any divergence between profit and loan rates
of interest would be short-lived and stressed the interdependence rather
than the disparity between the two rates. The classical economists, more-
over, did not fully perceive the policy (i. e., price stabilization)
implications of Thorton's analysis. Thus, after its initial formulation
by Thornton, the two-rate doctrine fell into neglect until Wicksell made
it the center of his monetary theory.

II. WICKSELL'S FRAMEWORK

Money Vs. Natural Rates of Interest

The central element of Wicksell's analysis, like Thornton's, is
the sharp distinction between two interest rates: (1) the money or market
rate and (2) the natural or equilibrium rate. The former is the rate charged

on loans in the money market. The latter, as Wicksell pointed out, can be interpreted in several ways. It is the expected marginal yield or internal rate of return on newly created units of physical capital. It is also the rate that would equilibrate desired saving and investment at the economy's full capacity level of output. Or, what amounts to the same thing, it is the rate that equates aggregate demand for real output with the available supply. It follows from this latter definition that the natural rate is also that interest rate level that is neutral with respect to general prices, tending neither to raise nor to lower them. According to Wicksell, as long as the market rate is equal to the natural rate, desired saving will just equal desired investment, aggregate demand will therefore equal aggregate supply, and price stability will prevail. Any discrepancy between the two interest rates, however, will cause prices to change. If, for example, the market rate falls below the natural rate, investment will exceed saving, aggregate demand will be greater than aggregate supply, and, assuming the excess demand is financed by bank loans resulting in the creation of new money, inflation will occur. Conversely, if the market rate rises above the natural rate, saving will exceed investment, bank loans and the stock of money will contract, there will be a deficiency of aggregate demand, and prices will fall. Wicksell assumed complete wage and price flexibility so that a decline in total spending would manifest itself in an absolute decline in the price level and not in production.

The Role of Money in Wicksell's Analysis

Although Wicksell's analysis is couched in terms of market and natural rates of interest, he does not neglect the role of money. In his

model, the price level cannot change unless there is a corresponding prior change in the quantity of money. These money stock changes accompany changes in the volume of bank loans used to finance excess aggregate demand. He specifically states that these changes in the money stock are necessary to permit price level movements to occur. But he insists that such money stock changes are caused by the discrepancy between the two interest rates. To illustrate, suppose banks set and maintain the market rate below the natural rate. Desired investment will exceed desired saving. The demand for bank loans will expand, putting upward pressure on the market (loan) rate of interest. To prevent the market rate from rising, the banks must be willing to accommodate all borrowers at the fixed rate. Assuming the banks are so willing, then the volume of bank lending will rise. And since new loans are granted in the form of increases in the checking deposits of borrowers, the money stock also expands. The monetary expansion is clearly a result of the gap between the two interest rates. This latter result is what makes Wicksell's monetary analysis unique. He does not accept the crude quantity theory view of purely exogenous monetary changes causing changes in the price level. Nor does he accept the "reverse causation" argument that price level changes produce changes in the money stock. In his model both money stock changes and price level movements stem from a common cause, namely, the discrepancy between the market and natural rates of interest.

The Cumulative Process

In Wicksell's model any discrepancy between the two interest rates will set in motion a dynamic sequence of spending and price level changes that will continue as long as the gap persists. Wicksell referred to this

sequence as the "cumulative process." He argued that the cumulative process could be either stable or unstable depending upon the type of monetary system a nation possessed. He considered two alternative types of hypothetical monetary arrangements, namely, (1) a "pure cash" system embodying the key characteristics of the gold standard and (2) an "ideal bank" or "pure credit" system using no metallic money, all payments being made by means of book-keeping entries. In the case of the pure cash system, Wicksell defines money to include only full-bodied gold coin and bank notes convertible into gold. Demand deposits are excluded, an expansion in their volume being treated not as an increase in the money stock per se but rather as a rise in the "virtual velocity" of specie reserves, enabling the latter to support a larger volume of money payments. In the case of the pure credit system, however, money is defined as consisting solely of demand deposits. And since there is no monetary demand for gold in the pure credit system, there is no need for banks to hold metallic reserves. Thus, the only conceivable form of bank reserves is central bank credit.

Wicksell maintained that in the pure cash economy the cumulative process necessarily plays an equilibrating role. During an inflationary period, for example, the rise in spending, prices, and the level of nominal national income results in (1) an internal drain of gold into hand-to-hand circulation and into non-monetary uses and (2) an external drain of specie to cover an adverse foreign trade balance stemming from the domestic inflation. The drain and threatened depletion of specie reserves forces banks to raise the money rate of interest, thereby bringing the inflationary process to a halt. Contrariwise, during a period of price deflation the steady accumulation of excess reserves will eventually induce banks, for lack of earnings, to reduce the loan rate of interest to stimulate borrowing.

Borrowing expands, spending increases, and the price level stops falling.
As before, a reserve-induced alteration in the money rate of interest serves
to restore equilibrium. In brief, the pure cash system contains a stabilizing
adjustment mechanism that brings the cumulative process to a halt.

According to Wicksell, however, no such automatic self-correcting
mechanism exists in the pure credit system. Since specie drains are not a
threat, banks need hold no reserves and thus are free to set and maintain
indefinitely any money rate they choose. In short, there exists no reserve
constraint in the hypothetical pure credit economy to limit the cumulative
process. Consequently, any spontaneous disturbance that upsets the initial
equality between the natural and market rates of interest will set in action
an inflation or deflation that can continue indefinitely.

At this point it is tempting to argue that Wicksell overlooked
one equilibrating element—namely competition—operating in the pure-credit
model of the cumulative process. Would not competition among borrowers and
lenders tend to equalize all interest rates, thus terminating any cumulative
process? More specifically, would not competition among bankers—especially
in their efforts to raise loan funds—force them to raise the rate of in-
terest paid on deposits and hence the rate charged on loans until those two
rates were bid up into equality with the natural rate? If competition does
act to eliminate spreads between interest rates, it follows that, even in a
pure-credit economy, the cumulative process can be no more than a temporary
phenomenon, Wicksell's claim to the contrary notwithstanding. Wicksell
therefore must have neglected the influence of competition.

In fact, however, Wicksell did not overlook competition. His
model explicitly assumes a competitive banking system in which banks pay
interest on demand deposits roughly equal to the rates charged on loans.

In essence, however, he argues that in a pure credit economy, competition in banking is a necessary but not a sufficient condition for price stability. Some quantitative restraint on the money supply is also required. Once this restraint is established, free competition among banks for the limited quantity of deposits will tend to equate market and natural rates. Without the quantitative constraint to limit deposit creation, however, competition in banking will manifest itself in persistent inflationary expansion of the money stock.

Finally, there is the question of which of the two hypothetical monetary arrangements--the pure cash system or the pure credit system-- Wicksell regarded as his standard case for purposes of policy prescription. As previously mentioned, according to Wicksell, the policy implications of the two cases differ greatly. In the pure cash economy the cumulative process itself serves as a fundamental equilibrating mechanism, minimizing the need for policy action. By contrast, in the pure credit system a cumulative process is not self-limiting (or so Wicksell argued) but may be of indefinite duration unless halted by positive policy action. Some economists, notably Don Patinkin (1965; p. 589) maintain that the pure cash system constitutes Wicksell's standard case. The evidence, however, points in the opposite direction. For it was the pure credit system that Wicksell tended to emphasize in his writings. His only formal model of the cumulative process is constructed on the assumption of a pure credit economy. And most of the monetary reforms he advocated during his lifetime were de-signed to make the hypothetical pure credit system a reality.[3]

---

[3]See Uhr (1960) pp. 231-4.

The Wicksellian Stabilization Criterion

As stated above, Wicksell's policy prescriptions follow logically from his model of the pure credit system. Since he believed that the latter system contained no endogenous equilibrating mechanism, he thought that price-level stability must be imposed by an exogenous regulator, that is, by the central bank. The maintenance of monetary equilibrium, he said, is the manifest responsibility of the central bank. It was for this purpose that he formulated his celebrated stabilization criterion, namely, that to preserve price-level stability the central bank should keep the money rate of interest (i) equal to the natural rate (r), or i=r.

However correct this Wicksellian criterion may be as an abstract principle, as a guide to policy it suffers from a serious practical defect. For its use requires knowledge of the natural rate of interest, generally regarded as a non-observable variable incapable of precise measurement. But Wicksell answered this criticism by noting that the authorities can, at least, be sure that if the price level is changing, the money rate is too high or too low relative to the natural rate and therefore should be changed. He proposed, therefore, that the price level itself be substituted for the natural rate as the target and indicator of monetary policy. Movements in the price level would signal the need for adjustment of the money rate of interest and indicate the desired direction of the change. A rising price level would call for an upward adjustment in the money rate, while a falling price level would indicate that a downward adjustment was in order. In short, the central bank should promptly adjust the market rate--i. e., its discount, or bank rate--in the same direction as the price level is moving, only ceasing to do so when price movement stops. In Wicksell's own words, stabilization policy

> does not mean that the banks ought actually to
> <u>ascertain</u> the natural rate before fixing their
> own rates of interest. That would, of course,
> be impracticable, and would also be quite un-
> necessary. For the current level of commodity
> prices provides a reliable test of the agree-
> ment or diversion of the two rates. The procedure
> should rather be simply as follows: <u>So long as</u>
> <u>prices remain unaltered the banks' rate of interest</u>
> <u>is to remain unaltered. If prices rise, the rate of</u>
> <u>interest is to be raised; and if prices fall, the</u>
> <u>rate of interest is to be lowered; and the rate of</u>
> <u>interest is henceforth to be maintained at its new</u>
> <u>level until a further movement of prices calls for</u>
> <u>a further change in one direction or the other.</u>
> (1936; p. 189)

III. INFLATIONARY EXPECTATIONS AND THE WICKSELLIAN MODEL

Wicksell's Inadequate Treatment of Expectations

For the most part, Wicksell's analysis of the cumulative process

is conducted on the assumption of the absence of inflationary or deflationary

expectations. No matter how much prices have changed in the past or are

changing currently, everyone expects them to remain unchanged over the

indefinite future. Anticipations of price stability are assumed to be

unshaken by actual price experience.

Wicksell, of course, did not ignore price expectations altogether.

He noted that after the cumulative process has continued for some time,

the assumption that anticipated future prices are identical to present ones

may have to be abandoned. Thus he states that

> The upward movement of prices will in some
> measure 'create its own draught.' When
> prices have been rising steadily for some
> time, entrepreneurs will begin to reckon
> on the basis not merely of the prices al-
> ready attained, but of a further rise in
> prices. . . . Once the entrepreneurs begin
> to rely on this [inflationary] process con-
> tinuing--as soon, that is to say, as they
> start reckoning on a future rise in prices--
> the actual rise will become more and more

> rapid. In the extreme case in which the
> expected rise in prices is each time _fully_
> discounted, the annual rise in prices will
> be indefinitely great. (1936; pp. 96, 148)

In the face of such a development, stabilization policy would

have to be modified somewhat. In his words

> To put an immediate stop to any further rise
> in prices, it would not be sufficient for the
> banks to restore the rate of interest to its
> original [natural] level. This would have
> the same effect on the business world as
> would a somewhat lower rate of interest at
> a time when prices are not expected to alter.
> (1936; p. 97)

The contention here apparently is that the eradication of inflationary

expectations requires that the market rate be raised temporarily above the

natural rate associated with zero inflationary expectations. With the

market rate established above the natural rate, anticipated price increases

will fail to materialize and expectations will be revised downward. Even-

tually the market rate will fall back into equality with the natural rate.

If, on the other hand, banks persist in trying to peg the market rate below

the natural rate, "_two_ forces [i. e., inflationary expectations and the gap

between the natural and market rates] will be operating in the direction of

higher prices, and the rise will be correspondingly more rapid." (1936; p. 97)

In view of the foregoing passages, one cannot deny that Wicksell

makes explicit allowance for price expectations. Nevertheless, it must be

admitted that he gave such phenomena only passing attention, perhaps because

he thought they could not produce a cumulative rise in prices but only accel-

erate such a rise once it had already begun. He made it clear that he

regarded inflationary expectations as special cases peripheral to his main

field of interest. Consequently, he did not develop further the insights

contained in the passages quoted above. In fact, the passages cited are

merely incidental remarks, i. e., isolated asides or qualifications to his

formal analysis of the cumulative process. They do not form a central part of his main conceptual framework. In short, although Wicksell recognized the possibility of inflationary expectations and even suggested how they might influence the behavior of interest rates, he did not integrate them systematically into his analysis of the cumulative process.

There was perhaps greater justification for minimizing the importance of inflationary expectations in Wicksell's time than in ours. In the 19th century prices were downwardly as well as upwardly flexible. Periods of inflation alternated with periods of deflation, perhaps contributing to a feeling of extreme uncertainty concerning the direction of future price changes. People, looking at past experience of both rising and falling prices, may have decided that the safest bet was to assume that future prices would, on balance, remain unchanged. Then, too, actual price changes were relatively small, perhaps well below the critical perception threshold necessary for the activation of expectations.

The situation is quite different today, however. Inflation—both actual and expected—seems to be firmly entrenched in the structure of the economy. Money illusion has diminished; recognition and adjustment lags have shortened. Owing both to the extensive publicity given to the problem of inflation and to the persistence of actual rates of price increase well in excess of the critical threshold level, there is greater awareness of inflation than ever before. Consequently, people react to it quicker and give it greater weight in formulating their expectations. Moreover, there is now less uncertainty about the direction of price movements, which appears to be steadily upward. And a monotonic upward trend of prices, unlike the price fluctuations of the 1800's, tends to generate anticipations of further inflation. Such inflationary anticipations

find expression in interest rate levels that reflect both lenders' fears of losing purchasing power and borrowers' hopes that inflation will transform nominally high rates into low real rates.

In short, expectations now play a major role in the behavior of interest rates. Therefore, in order to render Wicksell's analysis applicable to current policy issues, it is necessary to introduce price expectations into his model. This change requires two steps.

Interest Rates: Real Vs. Nominal

The first step is to specify that the relevant decision variable in the Wicksellian model is not the nominal rate of interest but rather the real or price-deflated rate, i. e., the nominal market rate adjusted for expected changes in the purchasing power of money. Borrowers and lenders react to this real rate, which bears a precise relationship to the nominal rate. The relationship is straightforward: the real rate is merely the nominal rate minus the expected percentage change of prices. Alternatively, the nominal rate is obtained by adding to the real rate the expected rate of inflation.

The expected rate of inflation gets incorporated into the nominal rate in the following way. Lenders, seeking to prevent an inflation-induced erosion of real yields, will demand that an inflation premium be added to the basic rate that would be charged on loans in the absence of inflation. Borrowers will be willing to pay the premium either because they expect a capital gain stemming from the inflation-induced appreciation of the market price of assets purchased with the proceeds of the loan, or because they realize that they will be able to repay the loan with depreciated dollars, i. e., money whose value has declined in terms of purchasing power.

Notice that the price-change variable comprising the inflation premium is the anticipated rather than the actual current rate of inflation. What matters to a banker who is deciding what real interest rate target to aim for is not the current rate of inflation but rather the rate expected to prevail over the life of the loan. The rate of inflation that actually occurs may of course differ from the anticipated rate, in which case the realized real market rate of interest will turn out to be different from the expected one. Such disparities between expected and realized real interest rates are in fact quite likely to occur, given the existence of lags in the formation of expectations. For example, suppose that bankers' price expectations are based on past price experience and are adjusted only with a delay. Then, in periods in which the level of inflation is higher than it was in the past, the anticipated rate of price increase will lag consistently behind the actual rate of increase, i. e., inflation will be systematically underestimated. As a result, the premium incorporated in nominal rates will be too small. The nominal rate of interest will not rise sufficiently to compensate for inflation, and the realized real rate will fall short of the expected one. These effects, however, are unlikely to be permanent. In the long run, expectations adjust to reality, inflation is completely anticipated and fully incorporated into nominal rates, and the realized real market rate of interest turns out to be the same as the expected one.

Exogenous Monetary Growth

The second step in integrating expectations into Wicksell's model is to reverse his assumption that banks set the market rate of interest and then accommodate the money supply to the investment-induced demand for bank

loans at that rate. Accordingly, in the analysis that follows, the money stock and its rate of change are treated as exogenous variables determined by the central bank, while the market rate is treated as an endogenous or dependent variable.

The assumption of exogenous monetary growth permits the model to be in stable equilibrium even though prices continue to rise. Full equilibrium, of course, also requires equality between natural and real market rates of interest. Such an inflationary equilibrium is impossible in Wicksell's original model, where equality between the two interest rates implies the absence of excess demand for capital, thus precluding the in- duced expansion of loans and creation of new money necessary to produce the equilibrium rate of inflation. To summarize, in Wicksell's original model, inflation is solely a disequilibrium phenomenon because only in disequilibrium can there be endogenous monetary growth to support it. By contrast, in the revised model inflation can also be an equilibrium phenomenon, exogenous monetary growth being invoked to explain the equilibrium rate of inflation.

Expectations and the Concept of Monetary Equilibrium

The insertion of expectations into Wicksell's model alters the equilibrium relationship between the market (nominal) rate of interest and the natural rate. The fundamental equilibrium condition in the original model states that the market rate (i) must equal the natural rate (r), or i=r. By contrast, in the modified model, the equilibrium condition states that the market rate (i) must equal the natural rate (r) plus the percentage rate of change of prices ($\dot{p}/p$), or $i = r + \dot{p}/p$. The latter condition follows from two requirements of long-run competitive equilibrium. The first is that expected and actual rates of inflation must be the same. The second require- ment is that real rates of return on all assets--real capital, demand deposits,

and loans—must be equal. Banks, of course, must earn at least the same
rate of return on loans that they pay on deposits. And in order to induce
people to hold deposits, banks must offer to pay a rate of interest at
least equal to the opportunity cost of holding deposits. But the oppor-
tunity cost of holding deposits is the foregone yield on real capital plus
the expected rate of inflation (the depreciation cost of holding deposit
balances), which in the long run equals the actual rate of inflation.
And since competition forces deposit and loan rates into equality, it
follows that, in equilibrium, $i = r + \dot{p}/p$. An alternative explanation of
the equation is that in equilibrium the nominal rate of interest on monetary
assets (i) must equal the nominal yield on real assets, this yield being
composed of the real rate of return on capital (r) plus the capital gain,
or rate of appreciation of the market price of the asset, due to inflation
$(\dot{p}/p)$.

This equation indicates that the insertion of expectations
into Wicksell's model changes the concept of monetary equilibrium from
one of a state of absolute price stability to one of a stable or steady-
state (non-accelerating, non-decelerating) rate of inflation. Constancy
not of the price level per se but rather of its percentage rate of change
is the hallmark of monetary equilibrium in the modified Wicksellian model.
And that equilibrium is not unique since it is consistent with any steady-
state rate of inflation or deflation (including a zero rate).

To illustrate, consider the following example. Suppose the
economy is initially in a state of monetary equilibrium. There is no
inflation or deflation and resources are fully employed. The market rate
of interest is equal to the natural rate. The money stock is growing at a
rate just equal to the constant rate of growth of real output (assumed for

simplicity to be equal to zero). Now assume that the monetary authority

suddenly and permanently raises the growth rate of the money stock. The

newly-created money enters the system initially via an expansion in the

supply of bank loans, thereby temporarily lowering the market (loan) rate

of interest below the unchanged natural rate. The spread between the two

interest rates creates an excess demand for goods causing prices to rise,

i. e., a positive rate of inflation emerges. With goods becoming increas-

ingly expensive, people demand more and more bank accommodation to finance

their purchases, and the increased demand for loans bids the loan rate of

interest back to its original level. But even though the nominal rate has

been restored to its initial level, the real (price-deflated) rate of

interest received by lenders has declined. By way of example, suppose

that the nominal rate has returned to its original level of 7% and the

newly-established rate of inflation is 3%. Then the realized real rate of

interest is only 4%, i. e., 7% - 3%. Unanticipated inflation has opened

up a gap between the real and nominal market rates of interest with the

real rate lying below the nominal rate. The cause of this gap is imperfect

foresight, i. e., a lag of inflationary expectations behind inflationary

experience. At first, inflation is underestimated and not fully incor-

porated into the nominal interest rate. Consequently, the nominal rate

does not rise sufficiently to compensate for inflation and the corresponding

real rate falls below the natural rate.

This gap does not last indefinitely, however, because anticipations

will be influenced by experience. In time, people will begin to adapt their

expectations to the actual rate of inflation and to incorporate these ex-

pectations into nominal interest rates. The inflationary component of the

nominal rate will begin to reflect the current rate of inflation. When this

happens, the nominal rate will begin to rise above, and the corresponding real market rate will converge upon, the natural rate. Thus, as the divergence between anticipated and actual inflation narrows, so too will the gap between the real market and natural rates of interest. Eventually, when expectations catch up with experience, the gap vanishes and monetary equilibrium is restored. In the new equilibrium: (1) the rate of inflation will be perfectly anticipated, i. e., the expected rate of inflation will equal the actual rate; (2) the actual rate of inflation will be completely incorporated in the nominal market interest rate; (3) the nominal market rate of interest will exceed the natural rate by the actual rate of inflation; (4) the real (price-deflated) market rate of interest will equal the natural rate; but (5) the steady-state rate of inflation will be higher than it was originally.

Policy Implications

Several important policy implications arise from the modified Wicksellian analysis. The first is that attempts to hold the real (price-deflated) market rate below the natural rate will result in explosive, ever-accelerating inflation. The real market rate will stay below the natural rate only as long as expected inflation lags behind actual inflation. But since expectations are always being adjusted in an attempt to catch up with current inflation, the latter must be continually accelerated via faster monetary growth to stay a step ahead of expectations. Thus, to maintain a gap between the actual and expected rates of inflation, the banking system must inject ever increasing amounts of money into the economy. What is required to hold the real market rate of interest below the natural rate is an accelerating inflation that is always underestimated.

Given time, however, even an accelerationist policy will prove ineffective as a means of holding the real market rate below the natural rate. The policy will cease to be effective once people become cognizant of it and learn to incorporate the rate of acceleration itself into their price anticipations.

A second policy implication is that since monetary equilibrium is consistent with any stable rate of inflation, the best the policymakers could do would be to choose a zero rate of inflation. But this means that once the economy has reached a state of non-inflationary equilibrium the authorities should never try to reduce the market rate below the natural rate, since attempts to do so inevitably lead, via shifting expectations, to positive steady-state rates of inflation.[4]

The third policy implication concerns the path that leads to the zero or other target rate of inflation. To lower the rate of inflation the monetary authorities must raise the nominal market rate (i) above the natural rate (r) by more than the rate of inflation ($\dot{p}/p$). This policy step will force the real market rate (i - $\dot{p}/p$) above the natural rate of interest, causing a contraction of aggregate demand and thereby provoking a downward cumulative process. As long as the real market rate exceeds the natural rate, actual inflation will fall below anticipated inflation, leading people to revise expectations downward. This sequence will continue until inflationary expectations vanish (i. e., $\dot{p}/p \rightarrow$ zero), and the monetary authorities adjust the market rate back into equality with the natural rate.

---

[4]One might also argue that a fully-anticipated inflation is less socially harmful than attempts to reduce it; therefore, once inflation has stabilized at a given level, the best the policymakers could do would be to leave it alone.

Here the downward cumulative process terminates at a zero rate of inflation.

A crucial policy issue relates to the speed of the path to price stability. Given that the reduction of inflation may entail temporary though painful rises in unemployment, the policymakers would want to know how long it would take to get the rate of inflation down to some given target level. Generally, the rapidity of the route to the goal rate of inflation would depend on the speed of adjustment of expectations. Given that people formulate anticipations of inflation partly on the basis of current experience, the bigger the disparity between experience and expectations, the faster are expectations likely to be revised. Since the difference between expected and experienced inflation is likely to be systematically related to the spread between the real and natural rates of interest, it follows that the more rapidly is the rate of inflation to be reduced, the higher must be the real market interest rate relative to the natural rate while inflation is subsiding.

It should be apparent that there exists not one but rather a variety of time paths to price stability, some faster than others. The authorities can choose from among these alternative paths. For example, they can elect to end inflation quickly by holding the real market rate at a very high level for a relatively short period of time. Or they can choose to eliminate inflation more slowly by maintaining the real rate at a somewhat lower level for a longer period of time. The choice will depend on the policymakers' estimates of the social harm wrought by inflation versus the side costs (e.g., unemployment) of fighting inflation. The policymakers will choose the path that in their estimation results in the smallest social cost in terms of a weighted average of inflation and unemployment (taking account of both duration and magnitude of these variables)

where the weights represent the comparative harm caused by each evil. If inflation were viewed as the more serious evil, the authorities would assign a higher priority to its quick eradication than they would if unemployment had the highest relative weight.

A word of caution should be inserted at this point. The preceding analysis assumed that any contractionary (i. e., high interest rate) policy would eventually reverse inflationary expectations and end inflation. In fact, however, inflationary expectations may be extremely resistant to contractionary policy. Such would be the case if the public, looking back at a succession of unsuccessful stop-go economic policies, were to expect the contractionary phase to be followed shortly by an expansionary phase and the consequent reactivation of inflation. In this case, inflationary expectations would be influenced not by current policy actions or recent and current rates of inflation, but rather by the observed past history of stop-go policy cycles.

The fourth policy implication is that the rate of inflation itself may have to serve as an operational guide to monetary policy, just as the price level was to serve as the indicator variable in the practical decision rules originally formulated by Wicksell. Since the natural rate is an unobservable variable, the only way to discern whether real and nominal market rates are sufficiently high is to observe what is happening to the rate of inflation. Accelerating inflation signifies that the real market rate of interest is below the natural rate and therefore should be raised. Decelerating inflation, by contrast, indicates that the real rate of interest is above the natural rate and need not be raised further as long as inflation is subsiding at a pace judged satisfactory by the monetary authorities.

A fifth policy implication is that a money growth rate target may be less risky than a nominal interest rate target. The revised Wicksellian analysis indicates that an inappropriate interest rate target will lead to an explosive cumulative process. The gap between the target and the natural rate of interest will widen and inflation will accelerate. By contrast, a wrongly set money growth rate target does not carry this risk. Instead, it will lead to a stable rate of inflation or deflation and will in this sense be superior to an interest rate target.

IV. A WICKSELLIAN INTERPRETATION OF THE RECENT U. S. INFLATION

If the modified Wicksellian framework is correct, then the U. S. experience of a generally accelerating rate of inflation over the interval 1965-1974 indicates that market interest rates were altogether too low during that period--too low, even, to attain inflationary equilibrium, much less absolute price stability. This interpretation may seem to run counter to the facts since market interest rates have reached historically high levels in recent years. But, as Wicksell himself pointed out, what matters is not the absolute level of the market rate itself, but rather that level in relation to the natural or equilibrium rate.

> The rate of interest is never high or low in itself, but only in relation to the profit which people can make . . . and this, of course, varies . . . In one word, the interest on money is, in reality, very often low when it seems to be high, and high when it seems to be low. (1907; p. 217)

It seems likely that the expected profit rate on capital has been high relative to real market interest rates, which explains why the demand for bank loans and the rate of economic expansion continued strong throughout much of the period despite phenomenally high nominal market rates. Far from being "too high," as was often alleged, market rates were

actually too low to act as a deterrent to borrowing, spending, and the consequent acceleration of inflation. It follows that the market rate, by itself, has been a deceptive indicator of the degree of monetary restraint. Policymakers along with many other observers seem to have been seriously misled by this indicator. At a time when Wicksellian analysis indicated that market rates should have been raised sharply to fight inflation, the authorities, sympathetic to the many complaints that interest rates were already too high, were trying to keep those rates from going any higher. These efforts only served to keep open the gap between natural and real market rates, thus accentuating the cumulative inflationary process that contributed to the rise in nominal rates.

This experience underscores one of the main policy conclusions derived from the revised Wicksellian analysis, namely that price stability may be better served if the central bank adheres to a money growth rate target rather than a nominal interest rate target.

References

1. Blaug, Mark. <u>Economic Theory in Retrospect</u>. Revised ed. Homewood, Illinois: Richard D. Irwin, Inc., 1968, pp. 158-9, 619-34.

2. Harrington, Richard. "The Monetarist Controversy," <u>Manchester School of Economic and Social Studies</u>, 39 (December 1971), 269-92.

3. Horwich, George. "The Proper Role of Monetary Policy," <u>Compendium on Monetary Policy Guidelines and Federal Reserve Structure</u>. U. S. Congress, House Committee on Banking and Currency. Subcommittee on Domestic Finance. December 1968, pp. 294-304.

4. Laidler, David. "On Wicksell's Theory of Price Level Dynamics," <u>Manchester School of Economic and Social Studies</u>, 40 (June 1972), 125-44.

5. Lutz, Friedrich. "Inflation and the Rate of Interest," <u>Banca Nazionale del Lavoro Quarterly Review</u>, (June 1974), 99-117.

6. Patinkin, Don. <u>Money, Interest, and Prices</u>. 2nd ed. New York: Harper and Row, 1965, pp. 587-97.

7. Sargent, T. J. "Commodity Price Expectations and the Interest Rate," <u>Quarterly Journal of Economics</u>, 83 (February 1969), 127-40.

8. Tanner, J. E. "A Wicksellian Indicator of Monetary Policy," <u>Journal of Monetary Economics</u>, 1 (1975), 171-85.

9. Thornton, Henry. <u>An Enquiry into the Nature and Effects of the Paper Credit of Great Britain (1802)</u>. Edited with an Introduction by F. A. v. Hayek. New York: Rinehart and Company, Inc., 1939.

10. Uhr, Carl. <u>Economic Doctrines of Knut Wicksell</u>. Berkeley: University of California Press, 1960.

11. Wicksell, Knut. "The Influence of the Rate of Interest on Commodity Prices," <u>Economic Journal</u>, 17 (June 1907), 213-20.

12. _____. <u>Interest and Prices</u>. Trans. by R. F. Kahn. With an Introduction by Professor Bertil Ohlin. London: Macmillan, 1936.

13. _____. <u>Lectures on Political Economy</u>. Volume II: <u>Money</u>. Trans. by E. Classen. London: Routledge and Kegan Paul, 1935.