International Applications of the P* Theory:

Great Britain

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There is a new inflation forecaster now in use at the Federal Reserve Board that has as many economists praising its inherent worth as are condemning it to obscurity. The model in question here is known as "P-Star", an algebraic equation that stands for future prices. Though relatively new to American economic analysis, it was a quest that began with current Federal Reserve Board Chairman Alan Greenspan back in 1959 when he tried to formulate a way to spot an economies inflationary potential.[1] In 1987 Greenspan sent out three Federal Reserve Economists; Richard D. Porter, David H Small, and Jeffery J Hallman (hereafter referred to as HPS) to solve his dilemma. In February of 1988, before the Senate Banking Committee, Mr. Greenspan introduced the public to their creation; P Star.

$$P* = \frac{(M2)(V*)}{Q*}$$

This equation is a simple algebraic twist of Irving Fisher's equation of exchange in which $(P)(Q)=(M)(V)$. In the HPS formulation, $P*$ is the general level of future prices, M2 is one of the official measures of money in an economy, $V*$ is a constant representing the mean velocity of M2 over a certain time range, and $Q*$ is an estimate of the nation's GNP in the future, referred to as "real potential output". This approach is founded on two critical assumptions; that real output (Q) fluctuates around potential real output $Q*$, and that velocity (V) revolves around an equilibrium level $V*$. With these in mind, it would then follow that if M2 remains fixed, then the price level will fluctuate around $P*$. (The validity of these assumptions is not of primary issue here, but they should be noted as areas of concern when P seems to deviate from $P*$ uncharacteristically).

The price gap, $p-p*$, is defined as the sum of the velocity gap $(v-v*)$ and the output gap $(q*-q)$, with lower case notation to denote logarithms of their respective variables. This price gap model is a meshing of both Keynsian and Monetarist theories of inflation.

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[1] Can Inflation be Predicted? Federal Reserve Sees A Way.
New York Times. June 13, 1989 pg. A1

"In monetarist models, an increase in [m2] temporarily decreases velocity below its trend, V*. This leads to an increase in spending, in turn leading to higher prices until velocity has reached its trend and equilibrium is restored. Inflation in most Keynsian models is determined by past inflation, due to inertia, and the output gap, due to price stickiness."[2]

The p* theory holds that when "p" is resting below p*, inflation is posited to accelerate in the near future as "p" approaches the equilibrium price level. Likewise, when p rests above p*, future inflation is posited to decrease. (One primary bone of contention with this model is exactly how far into the future these inflationary "adjustments" are to take place.)

As a U.S. economic creation, most research with this model has subsequently been undertaken using U.S. economic data. The issue here is that of p* credibility outside the U.S., more specifically in Britain. As a country with a similar capitalist foundation and market structure, does the application of p* analysis as a forecaster of inflationary trends yield beneficial results?

For Great Britain, M2 consists of notes and coin in circulation plus sterling retail deposits held by the UK private sector with UK banks. Q* was "constructed" using the warranted forecast of a real output growth rate of 2.5% per annum. The inflation rates were derived from the consumer price index. The equation regressed here is the standard HPS model. The model regressed is as follows:

$$\Delta \Pi_t = \beta_0 + \beta_1 (P_{t-1} - P^*_{t-1}) + \varepsilon_t$$

As suggested by a similar study done in Australia (Coelli and Farher, 1992), the results

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[2]Coelli, Michael and Jerome Fahrer "Indicators of Inflationary Pressure" RDP 9207 Economic Research Department, Reserve Bank of Australia

above will be compared to a simple model where inflation depends solely on past inflation due to inflationary momentum:

$$\Delta\Pi_t = \beta_o + \beta_1(\Pi_{t-1}) + \beta_2(\Pi_{t-2}) + \beta_3(\Pi_{t-3}) + \beta_4(\Pi_{t-4}) + \varepsilon_t$$

The results from the regressions of the above equations (Table 1) leave much to be desired.

Sample Range 1958 - 1985		
	p* model	Inflation momentum
Beta (0)	0.225	1.497
t-score	0.342	1.277
Beta (1)	11.094	-0.260
t-score	1.404	1.280
Beta (2)	-	-0.132
t-score		0.491
Beta (3)	-	0.279
t-score		1.027
Beta (4)	-	-0.049
t-score		0.248
F-Statistic	1.973	1.236
R-Squared	0.035	0.034
D.W. Statistic	2.036	2.337

Table 1

As noted with the p* results, the null hypothesis that β_t is greater than zero cannot be rejected, even at the 10% level of significance. Also noted are the weak R-squared results for both models, helping to confirm that neither formula completely captures the variables that effect future inflation. It can not be expected that the inflationary

momentum model will perform terribly well at forecasting inflation, but the fact that the p* model brought little improvement was disappointing.

So what can be drawn from what would seem to be weak evidence of p* ability to spot future inflationary trends in Britain? The answer is not much. Though it would seem that in a *qualitative* framework the p* model does seem to forewarn of inflationary changes in the near future, the *quantitative* results confirm that perhaps the p* model is too simple for its own good. The fact that the regression results derived from the p* model yield no improvements over the baseline model of inflationary momentum raises the obvious questions; are the two key assumptions (That there is in fact a "q*" and "v*") warranted, and what other variables are effecting the British inflationary changes not accounted for in p*?

Though not as great a controversy in the U.S. as in Britain (until recently...) is that of V actually having a trend, V*. M2 was chosen for this study partly because its velocity was relatively more stable than alternative monetary aggregates. Yet, it is essential to the success of p* as an indicator model that the process generating the trend (either deterministic or stochastic) is stable.[3] Note that twice within this sample velocity deviated from V* by large amounts (1972 and again in 1976). Also note that from 1961(2) until 1972(3) the velocity consistently rested above V*. For p* to work, it must hold that velocity returns to its "trend" fairly soon. It can be argued that either this assumption doesn't hold true for Britain, or that no British monetary aggregate can be considered to have a trend velocity and hence p* analysis isn't warranted. Either way, the consistent velocity gap evident in this sample could be one of the reasons for p* poor performance.

It has been noted that British inconsistent economic policies hamper p* application as well.

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[3]Coelli, Michael., and Jerome Fahrer "Indicators of Inflationary Pressure" RDP 9207 Economic Research Department, Reserve Bank of Australia. July, 1992 p 3

"The attempts to avoid [inflation] by tightening fiscal and monetary policy might have worked had they been maintained with persistence, but such persistence was unlikely in a new government that had pledged to produce rapid economic growth. Instead the government tried to bolster its policies by considerable intervention in price and wage setting."[4]

Some immediate internal policy decisions become evident, and their effect on inflation obvious. July to December, 1966: a pay and price freeze; January to June, 1967: a period of severe fiscal restraint; March '68 to December '69: a 3.5% limit on wage and salary increases. The list goes on and on as Prime Minister Harold Wilson and his Labour Government viewed incomes policies and interest rates as primary concerns. There was a change in the British leadership in 1964, 1970, 1974, and 1979, and this was a primary reason for the inconsistent policy application. But despite these switches in leadership and policy, one belief held true within both the conservative and labour parties; that inflation was a *social* rather then economic phenomenon.

"A number of such social explanations were put forward: the breakdown of order reflected in the student riots of 1968, the takeover of major trade unions by left wingers, and so on. Given this new explanation for inflation, the Government concluded that the uncomfortable choice between full employment and price stability no longer had to be made."[5]

The point to note is not what particular variables should be included for a more accurate inflationary forecaster. The key conclusion is that there are such variables, and the p^* model does a poor job of forecasting inflation in Britain. This conclusion is expected, however. The Federal Reserve's model posits that inflation is determined merely by the money supply, but in reality we know that inflation is actually
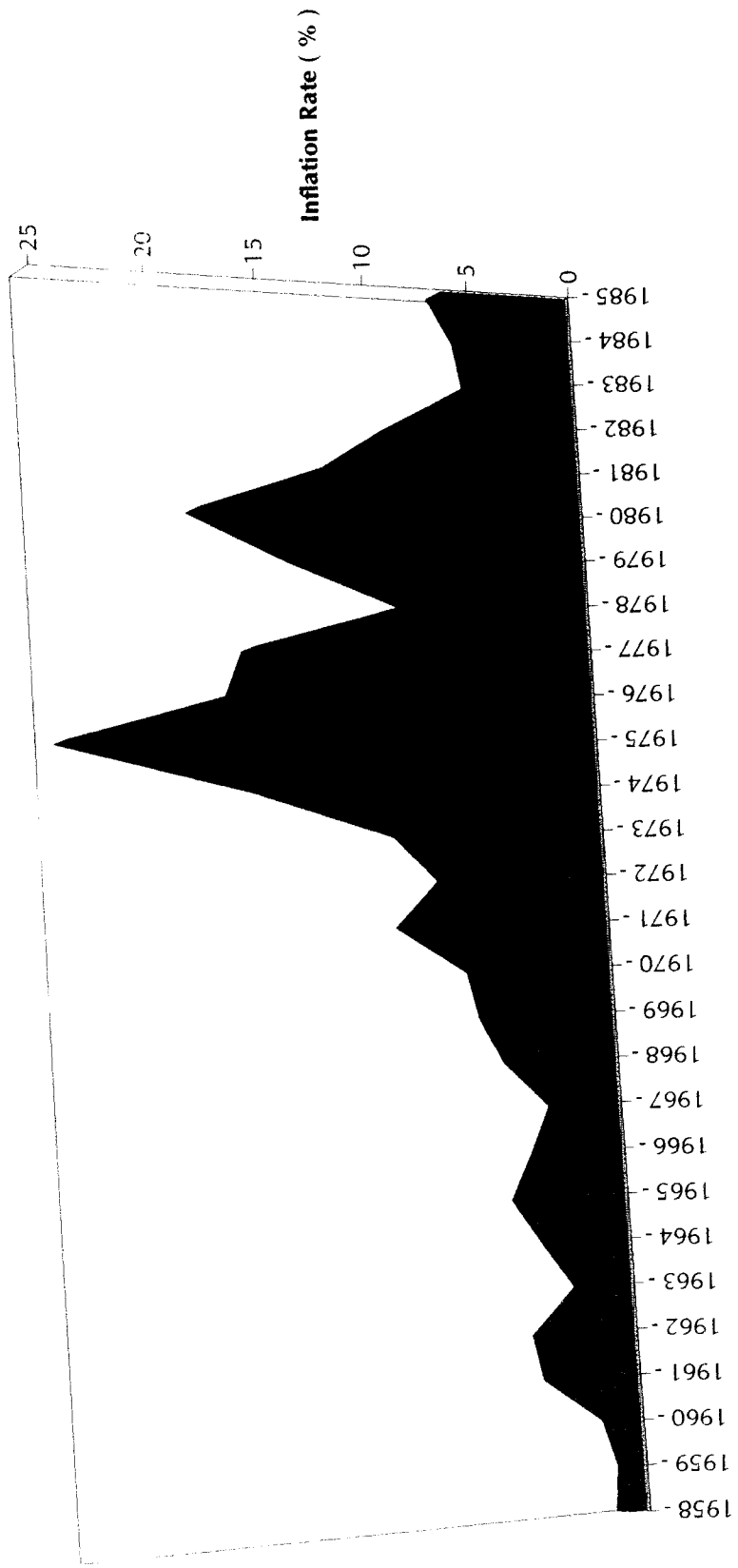
[4]Budd, Alan,. and Geoffrey Dicks "International Patterns of Inflation: A Study in Contrasts" American Council of Life Insurance (1984) p 105
[5]Budd, Alan,. and Geoffrey Dicks "International Patterns of Inflation: A Study in Contrasts" American Council of Life Insurance (1984) p 107
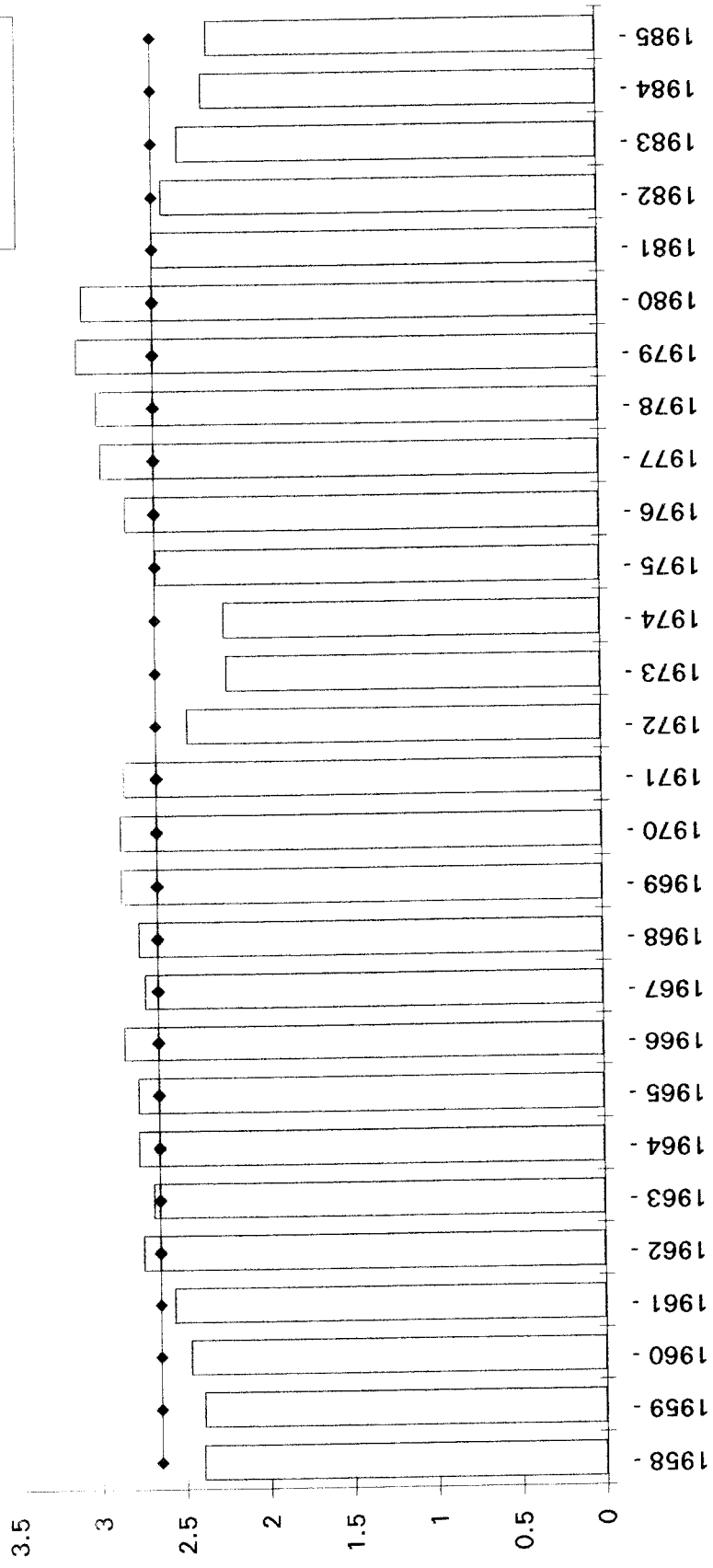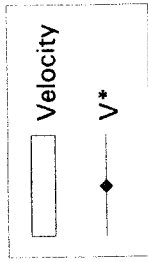
determined by various sectors of the economy. Hence, the model is to be praised for its simplicity in application and analysis, but the British should take extreme caution when constructing policy according to its poor results.
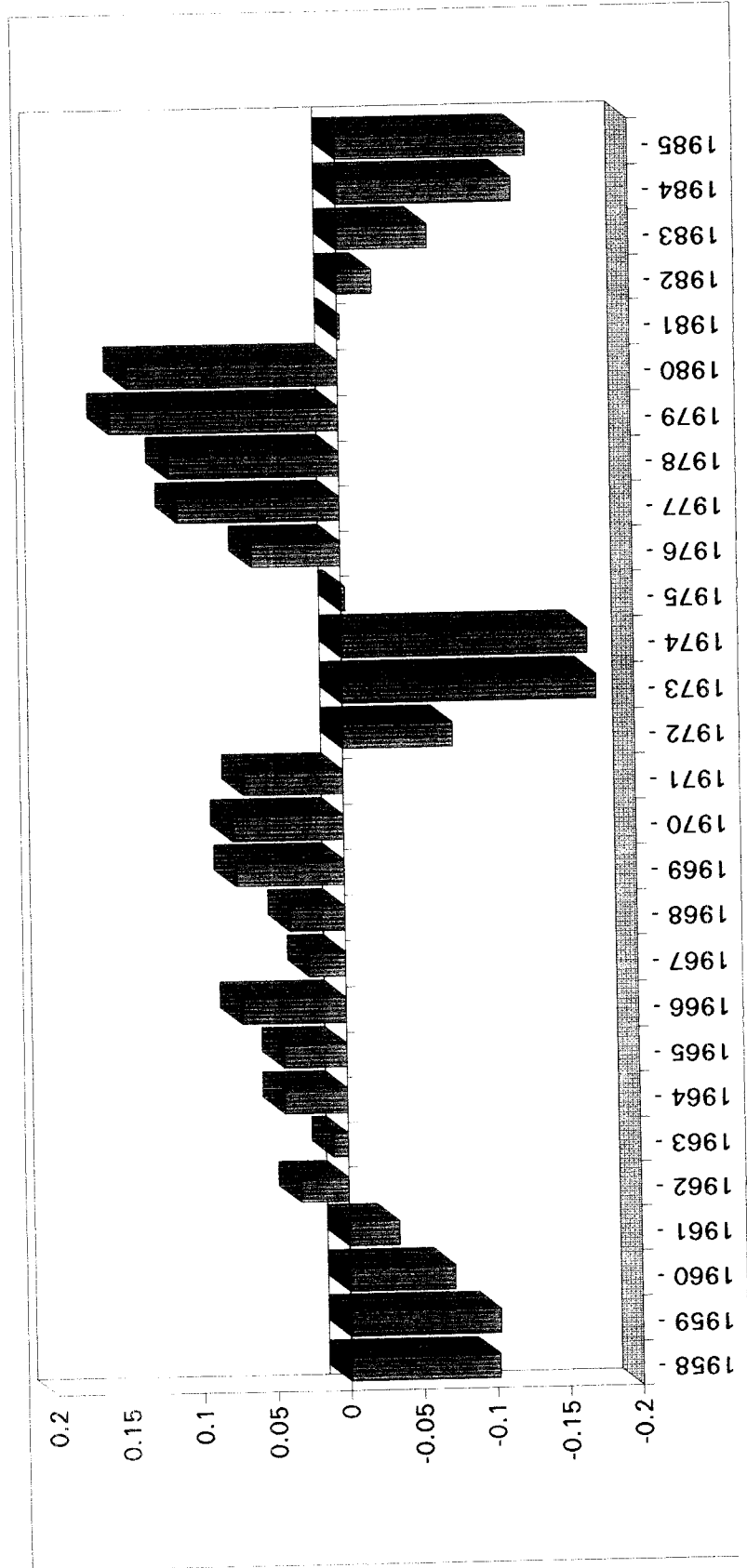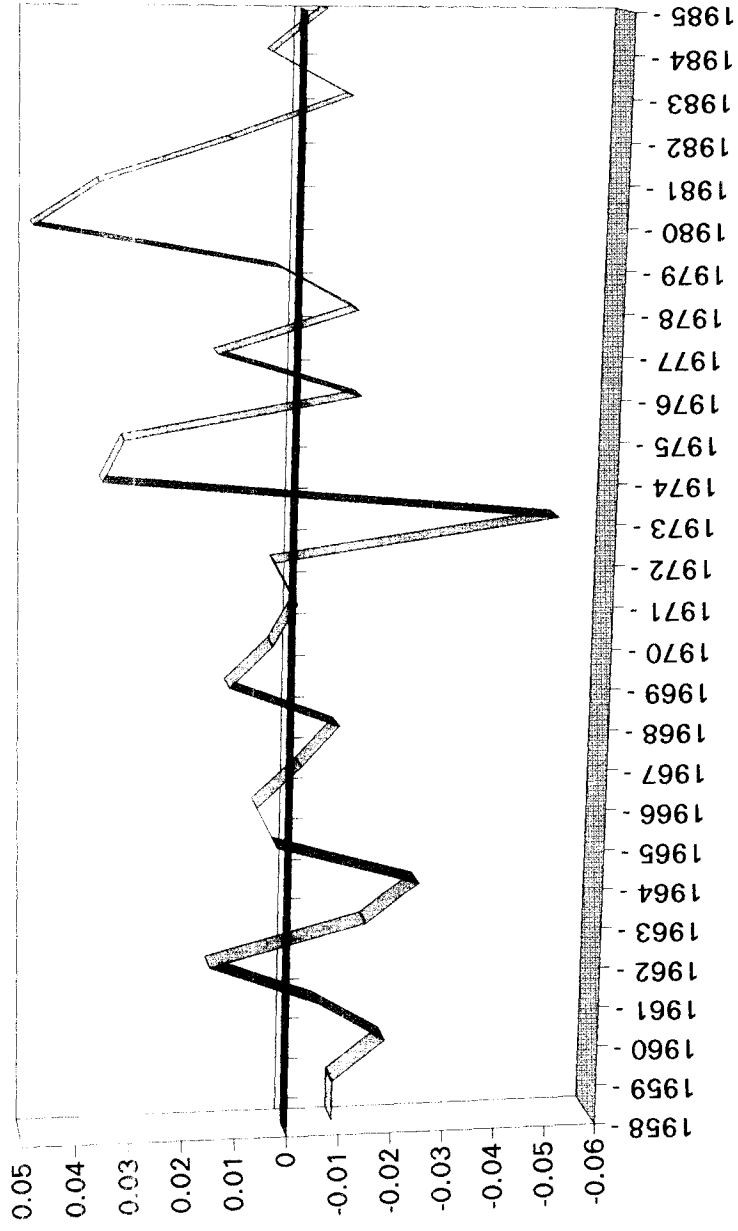
Inflation Rate: Britain
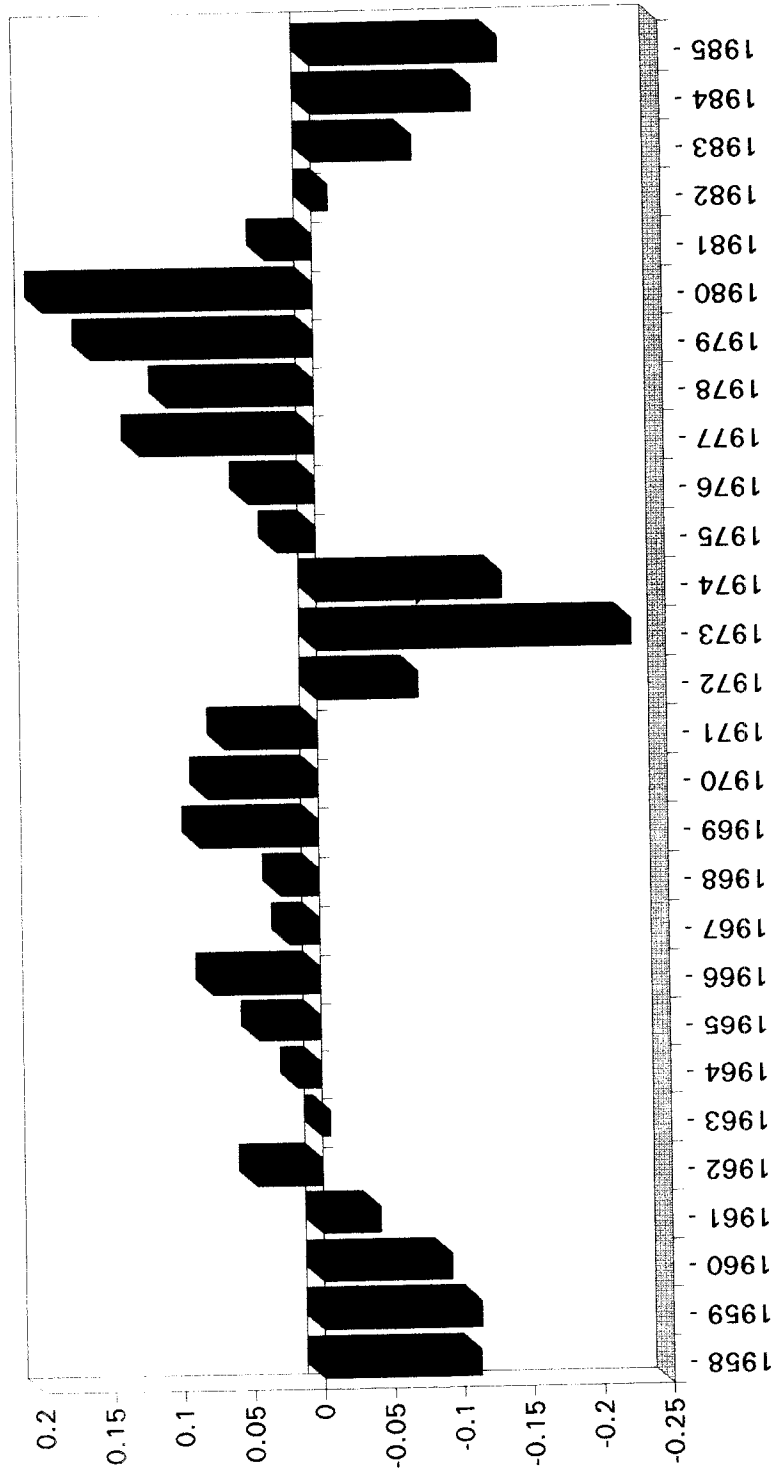
Inflation Rate (%)

VELOCITY OF M2 AND V*: BRITAIN

VELOCITY GAP V - V*: BRITAIN

OUTPUT GAP Q* - Q: BRITAIN

PRICE GAP P-P*: BRITAIN

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