The Choice of a Monetary Policy Instrument

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Alternative methods of conducting monetary policy have been extensively debated in recent years. Much of the debate has centered around the question of whether the Federal Reserve should use interest rates or the money supply as the instrument variable in conducting monetary policy. This article analyzes some aspects of this question. The first section of the article defines an instrument variable and outlines the relationship between instrument and goal variables. A model of the economy is presented in the second section. The third and fourth sections use the model to analyze the choice of an instrument variable. The last section summarizes the article findings.

INSTRUMENT AND GOAL VARIABLES

An instrument variable is one the Federal Reserve controls on a continuous basis. By controlling instrument variables, the Federal Reserve influences the behavior of goal variables, which measure conditions or processes related to the System's overall economic goals. The Federal Reserve's goals include, in general terms, reasonable price stability, high employment, satisfactory economic growth, and international balance. For example, a price index may be a goal variable because it measures the extent of inflation, a process related to the general goal of price stability. Thus, one objective of the Federal Reserve in controlling instrument variables may be to influence the behavior of a price index.

Instrument variables have two characteristics. First, they are controllable—that is, they are closely related to Federal Reserve actions; and they can be observed continuously so that any imprecision in the relationship can be immediately compensated for by Federal Reserve actions. The other characteristic is that instrument variables are closely related to goal variables or to other variables related to goal variables; and information is available about these relationships.

Because a number of variables are potential instrument variables, the Federal Reserve must choose one or more to control. As mentioned earlier, this article deals with the choice between the interest rate and the money supply. The article also discusses the alternative of using both variables as instruments.[1] When only the interest rate is used, a "pure" interest rate policy is followed, defined as a policy of maintaining the interest rate at a specified level

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1 The article assumes that there is only one interest rate and one measure of the money supply. Also, the article assumes that both the interest rate and the money supply can be continuously controlled. While these assumptions are unrealistic, they allow the analysis to focus on the important issue of the choice between interest rates and the money supply.

for a specified period. The period is referred to as the decision period. When only the money supply is used as an instrument variable, a pure money supply policy is followed, defined as a policy of maintaining the money supply at a specified level during the decision period. When both variables are used, a "combination" policy is followed, defined as moving the interest rate and the money supply during the decision period in response to certain developments.

National income is treated as the Federal Reserve System's goal variable in this article. It is assumed that policymakers want to achieve a specified level of income because income below that level is accompanied by unutilized resources, while income above that level is accompanied by inflationary pressures.

THE IS-LM MODEL

In considering the instrument choice problem, the relationship between instruments and goal variables must be analyzed. To do so, a model of the economy is needed. One frequently used is the IS-LM model, a highly simplified theoretical macroeconomic model. Due to the simplified and theoretical nature of the model, conclusions about monetary policy based on the model are not definitive. Policy analysts, however, have found the model very useful in identifying general considerations relevant to the choice of instrument variables.

The IS-LM model has three variables—national income, the interest rate, and the money supply. The major focus of the model is real national income, which (in the absence of supply constraints) is determined by the aggregate demand for goods and services. Aggregate demand, in turn, is generally determined by two broad sets of factors—"real" factors and "monetary" factors. Real factors refer to factors—such as the return on investment—that directly affect the public's aggregate spending (consuming, investing) and saving behavior. Monetary factors affect the public's money holding behavior and have an indirect effect on aggregate demand. In line with the real/monetary dichotomy, the IS-LM model divides the economy into real and monetary sectors. Each sector is summarized by one equation or function. In the real sector, the equation is the IS function which summarizes the relationship between income and the interest rate in the real sector. In the monetary sector, the LM function summarizes the relationship between income and the interest rate, given the supply of money.

The LM Function

The LM function is a relationship between the levels of real national income and the interest rate that are consistent with equilibrium in the financial or monetary sector of the economy. Monetary sector equilibrium means that, in the aggregate, economic units are holding the quantity of money balances they plan or demand to hold, and that the quantity of money demanded is equal to the quantity of money supplied, with the quantity of money supplied being given. Also, monetary sector equilibrium means that, if equilibrium exists, there is no tendency for income to change due to the underlying factors affecting equilibrium in the monetary sector—that is, due to adjustments by economic units with regard to their holding of money balances.

The LM relationship is based on one underlying relationship, along with the condition that the demand for money equals the supply of money. The underlying relationship is the demand for money function, or the relationship between the quantity of money demanded and the rate of interest and income.

To illustrate how a given combination of income and rate of interest may be consistent

with equilibrium in the monetary sector, assume that when the interest rate and income are at certain levels, say i_1 and y_1, economic units will demand to hold a certain quantity of money balances. Now assume the quantity of money supplied is equal to this quantity demanded, so that if i_1 and y_1 are realized, economic units will be holding the quantity of money they plan to hold—that is, the demand for money will equal the supply. Thus, given the supply of money, i_1 and y_1 are consistent with monetary sector equilibrium. When i_1 and y_1 are realized, there is no tendency for income to change due to factors affecting income in the monetary sector.

The LM function is a positive one—that is, a high rate of interest is associated with a high level of income and a low rate of interest is associated with a low level of income. The function is positive because the quantity of money demanded is negatively related to the rate of interest and positively related to the level of income. Money demanded is negatively related to the rate of interest because a relatively high interest rate encourages economic units to economize on money balances, while a low interest rate discourages units from economizing on balances. The quantity of money demanded is positively related to income because a relatively high level of income creates a need for a relatively high level of balances and a low level of income creates a need for a low level of balances.

To illustrate the positive slope of the LM function, assume that certain levels of the interest rate and income are consistent with monetary sector equilibrium. Now assume a higher level of income. At the higher level, economic units will demand more money balances, so that the quantity of money demanded will be greater than the quantity supplied. Now assume, in addition to the higher income, successively high levels of the interest rate. At the higher levels, units will demand fewer money balances. At some higher interest rate, the lesser demand due to the higher interest rate will offset the greater demand due to the higher income, leaving the quantity of money demanded unchanged and equal to the unchanged supply of money. Thus, the higher income requires a higher interest rate to maintain equilibrium.

As shown in Figure 1, the LM function "slopes upward and to the right." In the figure, monetary equilibrium exists if the rate of interest is i_1 and income is y_1, or if the rate of interest is i_2 (higher than i_1) and income is y_2 (higher than y_1). All other combinations of the interest rate and income that lie on the LM curve are consistent with monetary sector equilibrium, also.

The IS Function

The IS function is a relationship between the levels of real national income and the interest rate that are consistent with equilibrium in the real sector of the economy. Real sector equilibrium means that, given the interest rate and income, consumers are consuming the amount they intend or plan to consume, savers are saving the amount they plan to save, investors in capital goods are investing the amount they plan to invest, and that planned saving equals planned investment.[2] Also, real sector equilibrium means that, if equilibrium exists, there is no tendency for income to change due to underlying factors affecting income in the real sector—that is, due to adjustments by economic units with regard to the amounts they consume, save, and invest relative to their incomes and the interest rate.

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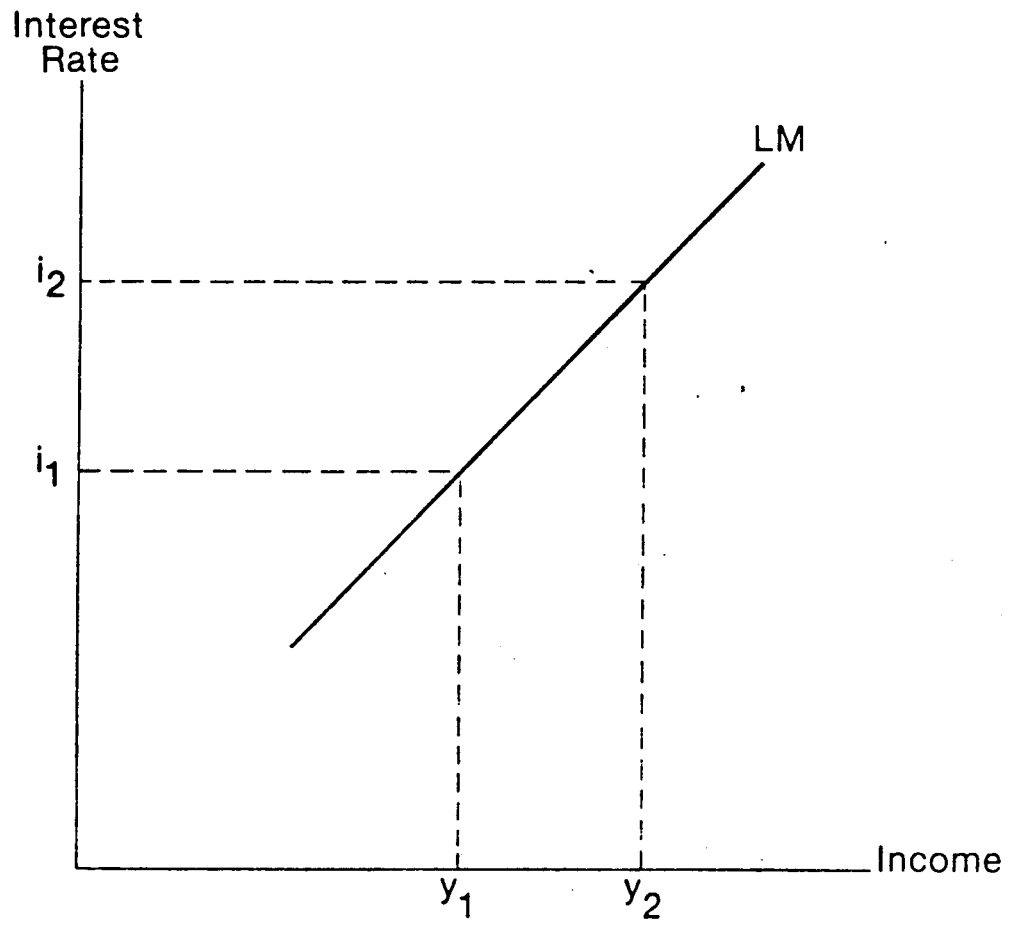
[2] In a more complete model, containing a government and a foreign sector, the equilibrium condition would be that saving equals domestic and net foreign investment plus the government's budget deficit.

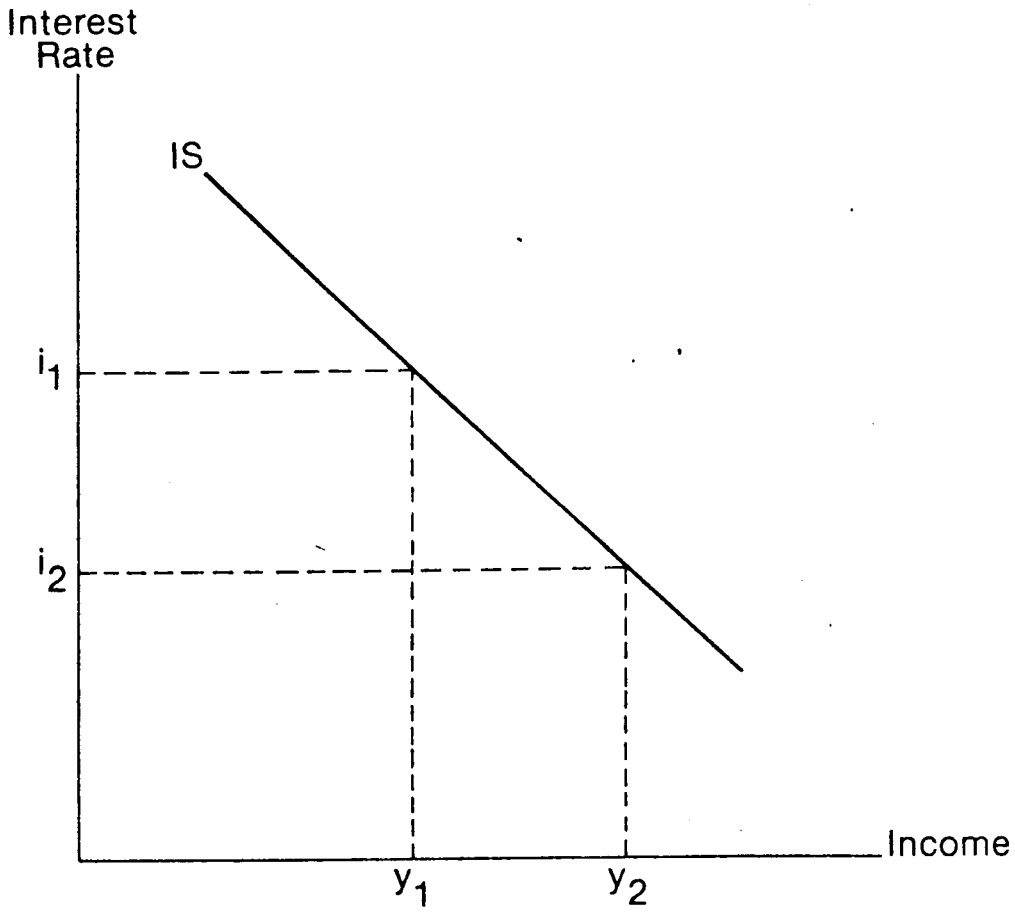
Figure 1
THE LM FUNCTION



The IS function is based on two underlying functions or relationships, along with the condition that planned saving equals planned investment. One underlying relationship is the investment demand function, a relationship between planned investment and the rate of interest. The other relationship is the consumption function, or alternatively the saving function, the latter being a relationship between income and planned saving.

To illustrate how a combination of income and the interest rate may be consistent with real sector equilibrium, assume that when the interest rate is at a given level, say i_1, investors plan a given amount of investment. If realized, the investment generates income in the sector of the economy that produces capital goods. Economic units receiving the income save part and consume part of the income. The part consumed also generates income, with part being saved and part consumed, and so on. Thus, the given level of investment generates or supports a given level of income, say y_1, with the level of income being that level at which the

Figure 2
THE IS FUNCTION



amount savers plan to save equals the amount investors plan to invest. Given the interest rate, i_1, the real sector equilibrium level of income is y_1. When i_1 and y_1 are realized, planned consumption, saving, and investment are realized; planned saving equals planned investment; and there is no tendency for income to change due to factors affecting income in the real sector.

The IS function is an inverse one—that is, a high rate of interest is associated with a low level of income and a low rate of interest is associated with a high level of income. The IS function is inverse because the underlying investment demand function is inverse. A high rate of interest tends to discourage investment and therefore results in a low level of income, while a low rate of interest tends to encourage investment and results in a high income. The inverse IS relationship is said to "slope downward and to the right," as illustrated in Figure 2. In the figure, real sector equilibrium exists if the rate of interest is i_1 and income is y_1, or if the rate of interest is i_2 (lower than i_1)

and income is y_2 (higher than y_1). All other combinations of the interest rate and income that lie on the IS curve are consistent with real sector equilibrium, also.

Full Equilibrium in the IS-LM Model

Full equilibrium in the IS-LM model exists if both the real and monetary sectors are in equilibrium. The full equilibrium combination of the rate of interest and income is a combination that is consistent with the conditions that planned saving equals planned investment, and the demand for money equals the supply of money, with the supply of money given outside the model. If full equilibrium exists, there is no tendency for income to change due to factors affecting income in either the real or monetary sectors.

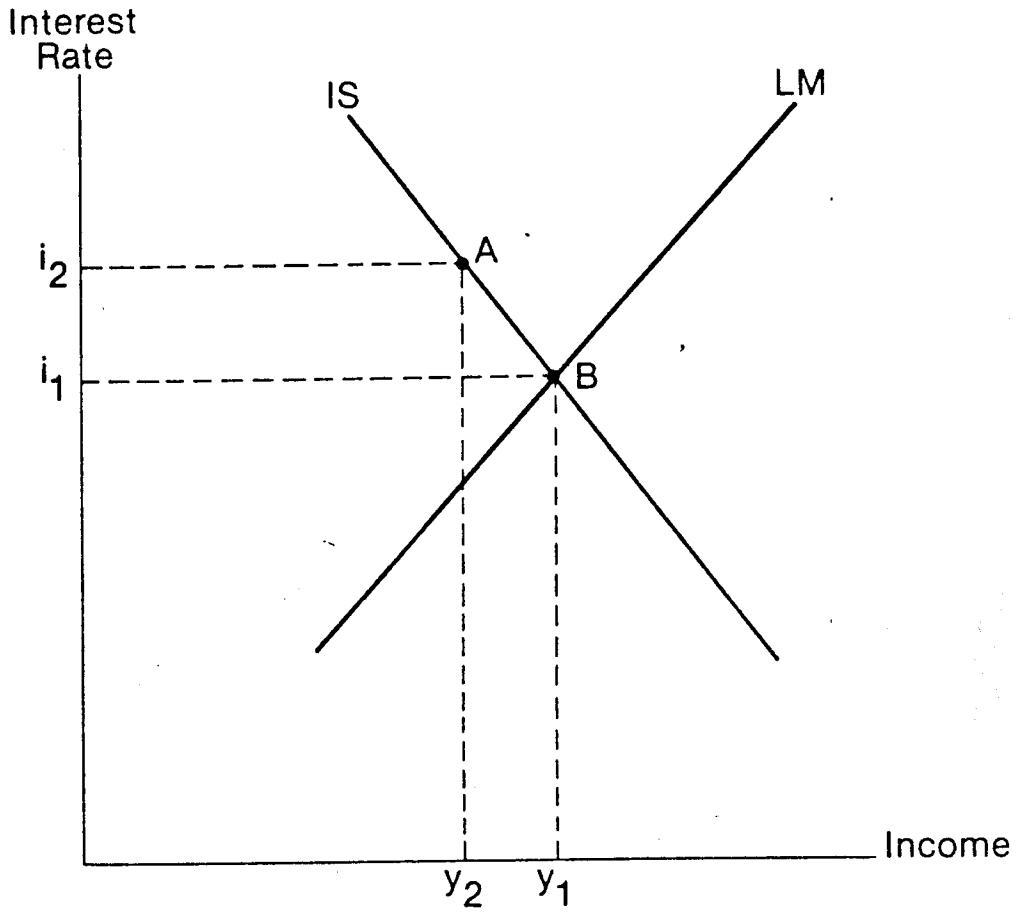
Full equilibrium may be illustrated graphically by drawing both the IS and LM functions on the same graph. The full equilibrium interest rate and income levels are given by the intersection of the two functions. In Figure 3, the full equilibrium combination of interest rate and income is i_1 and y_1. If any other combination of the interest rate and income exists, income tends to change. For example, at point A in Figure 3, real sector equilibrium exists and economic units are saving, consuming, and investing according to plan. However, monetary equilibrium does not exist, and the economic units are not holding the quantity of money balances they demand to hold. In particular, the supply of money exceeds the demand for money. Under these circumstances, units attempt to reduce their money balances by buying securities, which increases the price of securities and lowers the rate of interest. As the interest rate declines, investors tend to increase their capital investment, and the higher investment generates a higher income. These adjustments by economic units tend to propel the interest rate down and income up, so that the interest rate and income are propelled toward point B in Figure 3 and the equilibrium combination, i_1 and y_1.

Impact of a Change in the Supply of Money

The IS-LM model may be used to analyze the impact on the rate of interest and income of a change in the quantity of money supplied. Since the LM function assumes a given quantity of money supplied, a change in the supply of money causes the LM curve to shift. An increase in the supply of money shifts the function "to the right," because any given interest rate requires a higher income level to be consistent with the monetary sector equilibrium. The higher income level is required to increase the quantity of money demanded to the higher quantity supplied, so that the demand for and supply of money are equal. Similarly, a decline in the supply of money shifts the function "to the left." Thus, the position of the LM function is affected by the supply of money.

An increase in the supply of money that shifts the LM function to the right lowers the rate of interest and increases income, as illustrated in Figure 4. In the figure, the money supply is assumed initially to be a certain amount, M_1, which results in a certain LM function, labeled LM_1. Given M_1 (and the IS function), the interest rate is i_1 and income is y_1. Now assume an increase in the supply of money to M_2, which shifts the LM function to LM_2 and results in a decline in the interest rate to i_2 and an increase in income to y_2. The analysis of the forces that cause the interest rate and income to move from i_1 and y_1 to i_2 and y_2 is identical to the analysis of the movement from point A to point B in Figure 3.

Figure 3
FULL EQUILIBRIUM

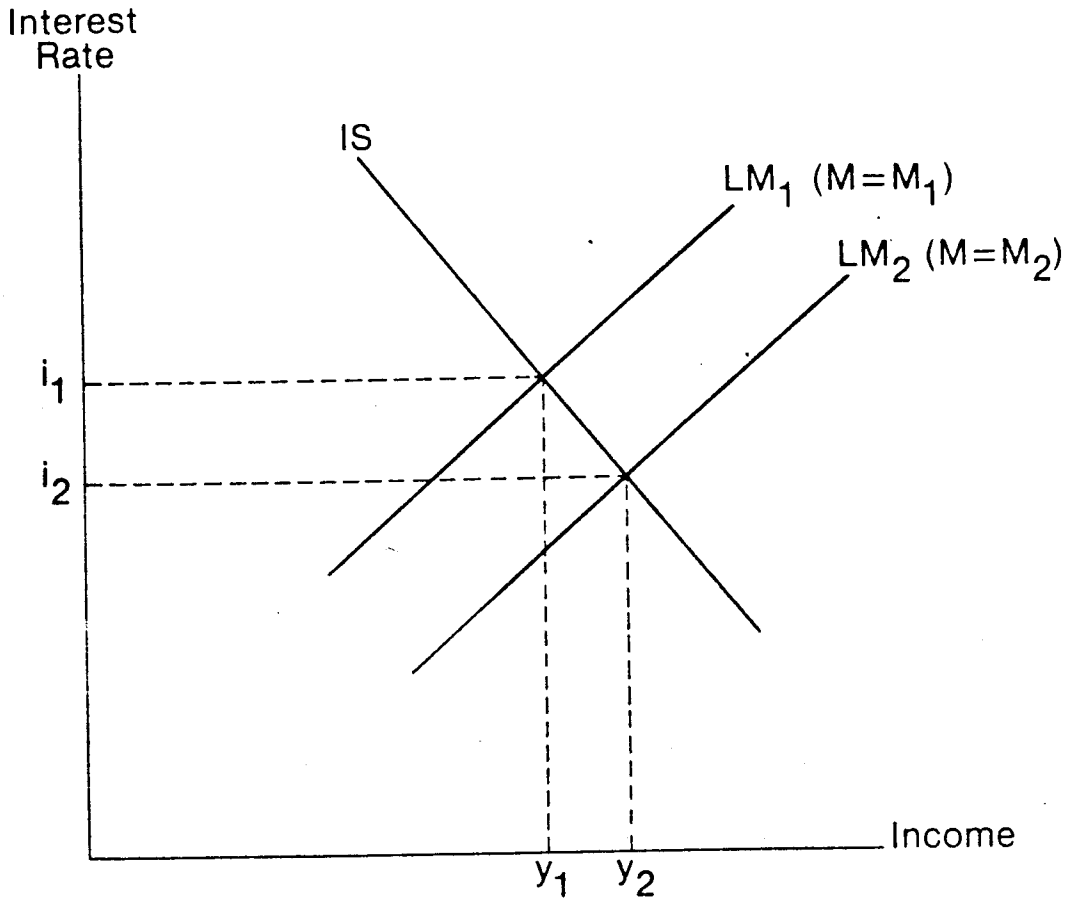


CHOOSING THE INSTRUMENT

The IS-LM model may be used to analyze the choice of the best instrument to use in conducting monetary policy.[3] This section treats the choice between the interest rate and the money supply, while the following section

[3] The IS-LM model was first used to rigorously analyze the problem of instrument choice in William Poole, "Optimal Choice of Monetary Policy in a Simple Stochastic Macro Model," *Quarterly Journal of Economics*, Vol. 84 (May 1970), pp. 197-216. Also, see Stephen F. LeRoy and David E. Lindsey, "Determining the Monetary Instrument: A Diagrammatic Exposition," *Special Studies Paper No. 103*, Board of Governors of the Federal Reserve System (1977); LeRoy and Roger N. Waud, "Applications of the Kalman Filter in Short-Run Monetary Control," *International Economic Review*, Vol. 18, No. 1 (February 1977), pp. 195-207; and Benjamin M. Friedman, "The Inefficiency of Short-Run Monetary Targets for Monetary Policy, Comments and Discussion," *Brookings Papers on Economic Activity*, (1977:2), the Brookings Institution, Washington, D.C., pp. 293-346.

Figure 4
IMPACT OF A CHANGE IN THE MONEY SUPPLY



discusses the possibility of using both variables. In general, the relative efficacy of the two variables as instruments depends on the relative closeness of their relationship to the goal variable, national income. Relative closeness depends on the characteristics of the IS and LM functions, linking the interest rate, money supply, and income. In particular, relative closeness depends especially on whether and to what extent the two functions are stable.

In view of the importance of stability, this section's analysis of instrument choice is divided into four parts distinguished by the extent of stability. In the first part, both the real and the monetary sectors are assumed to be stable. In the second part, the real sector is stable, but the monetary sector is unstable. In the third part, the real sector is unstable, but the monetary sector is stable; and in the fourth part, both sectors are assumed to be unstable.