The Choice of a Monetary Policy Instrument

By J. A. Cacy

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 inforination 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

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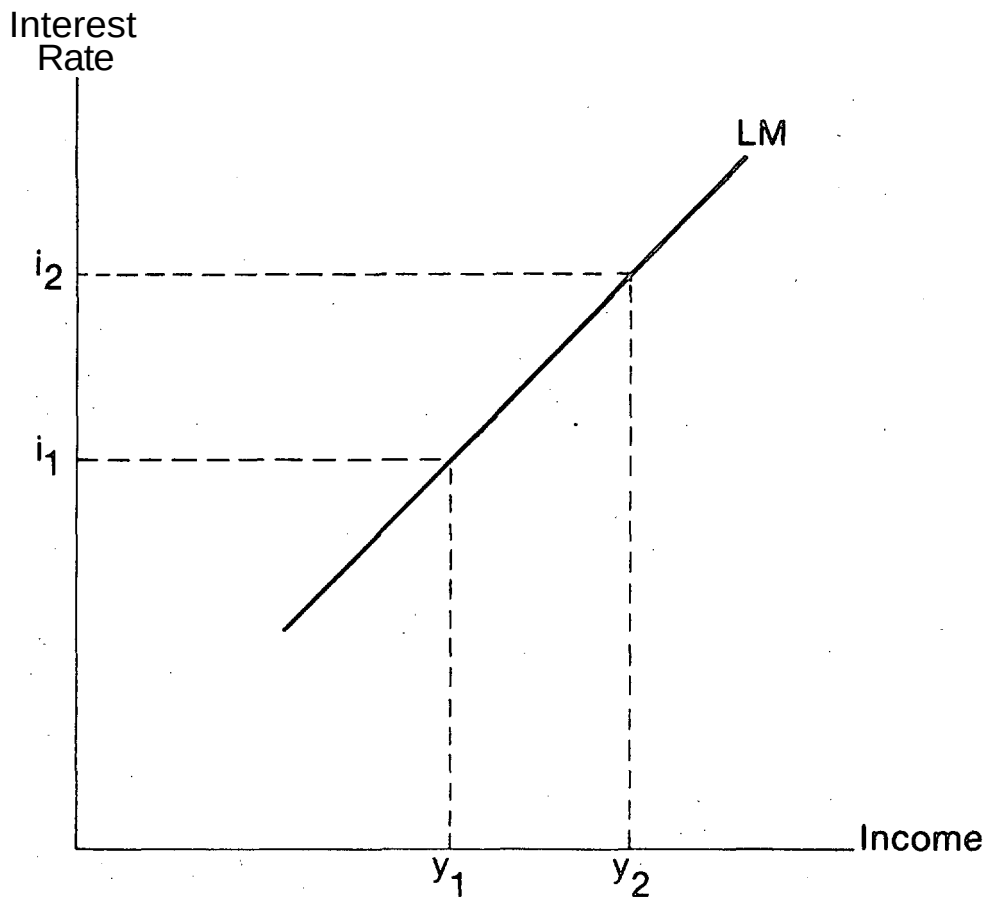
2 In a more complete model, containing a government and a foreign sector, the equilibrium condition would be that saving equals domestic and net foreign investment plus the government's budget deficit.

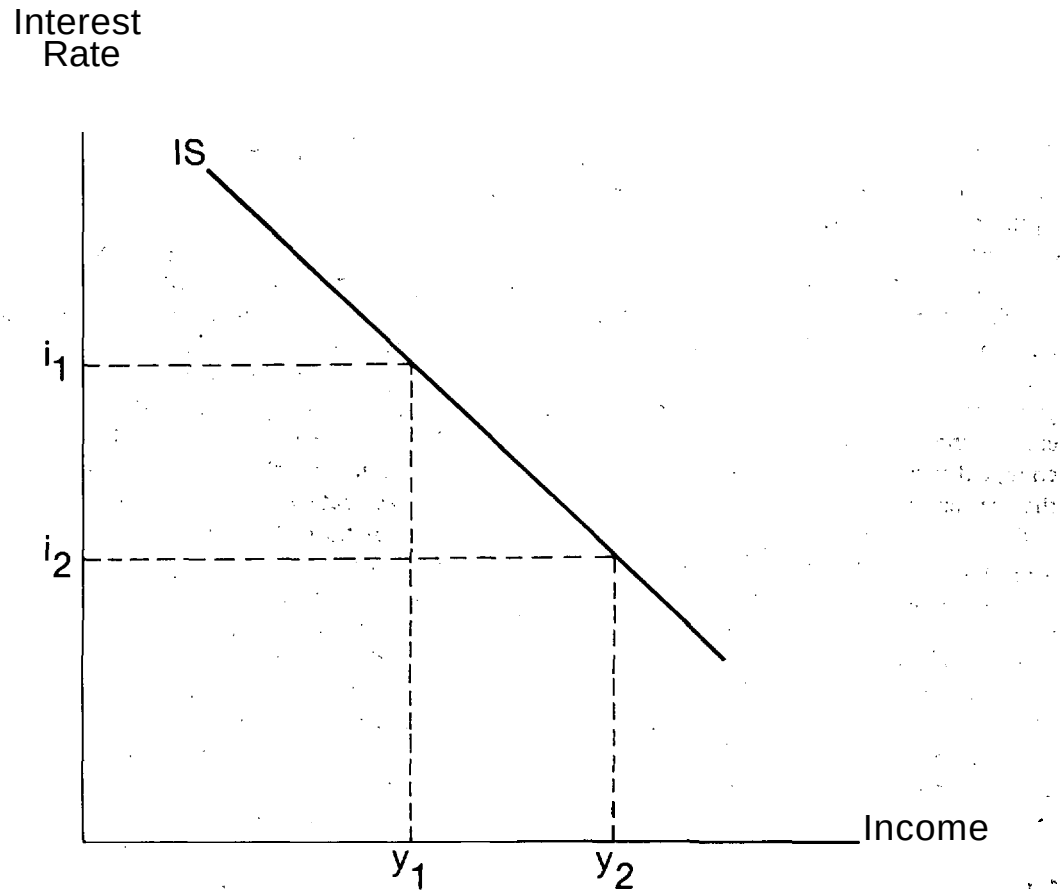
Figure 1
THE LM FUNCTION



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,). 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.

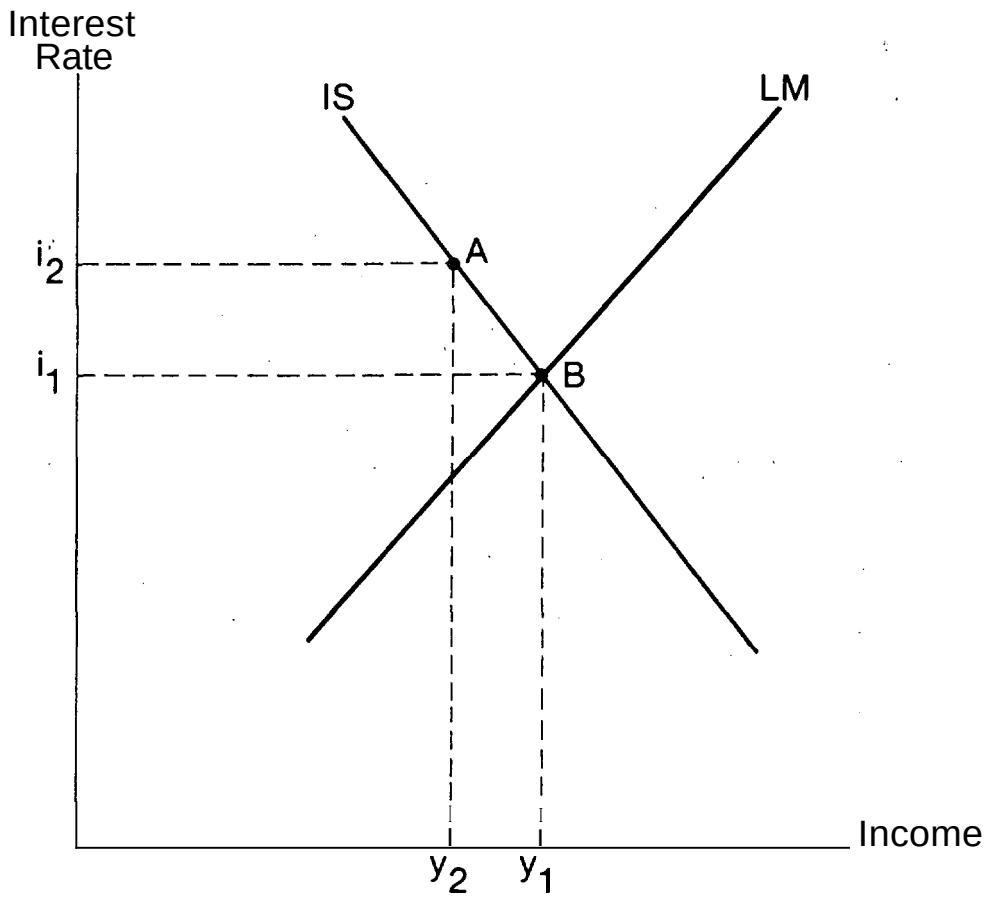
Full equilibrium may be illustrated graphically by drawing both the IS and LM functions on the same graph. The full equilibrium interest rate and income levels are given by the intersection of the two functions. In Figure 3, the full equilibrium combination of interest rate and income is i, and y,. If 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, and y,.

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,, which results in a certain LM function, labeled LM,. Given M, (and the IS function), the interest rate is i_1 and income is y,. Now assume an increase in the supply of money to M_2, which shifts the LM function to LM, and results in a decline in the interest rate to i, and an increase in income to y,. The analysis of the forces that cause the interest rate and income to move from i_1 and y, 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

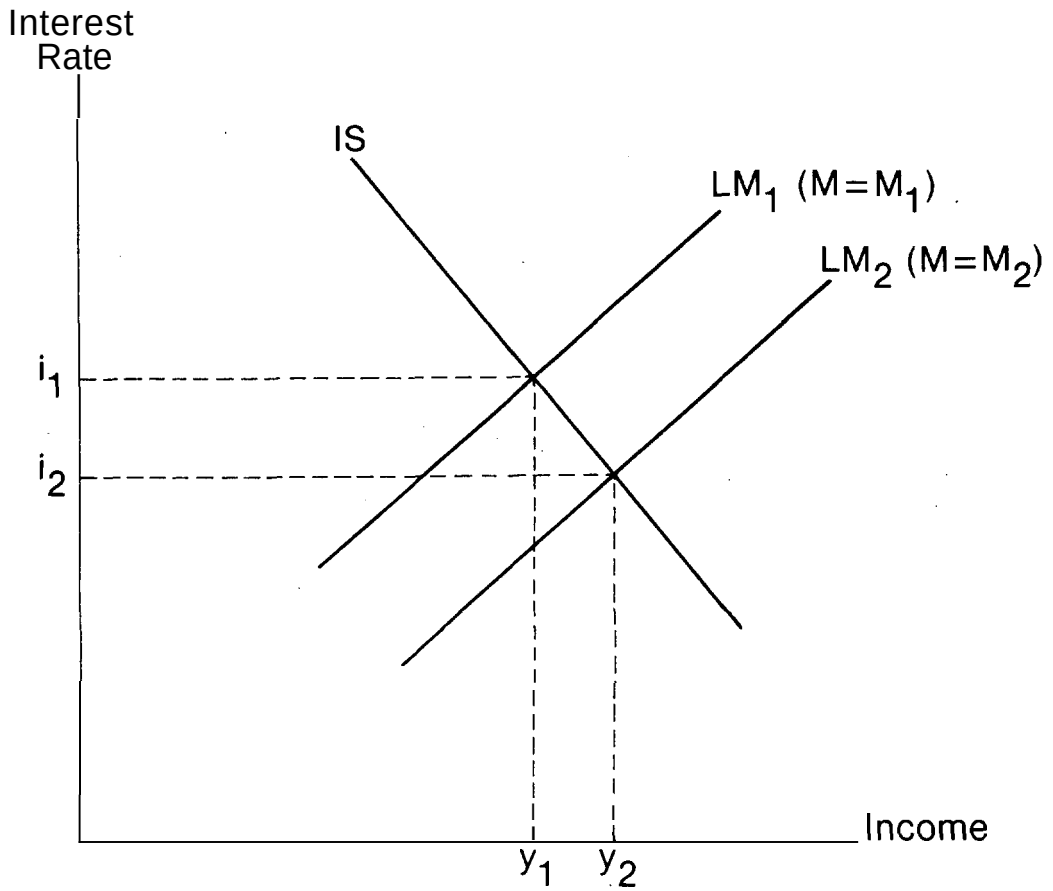


CHOOSING THE INSTRUMENT

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.

The analysis of the better instrument is preceded by a brief discussion of the meaning of stability and instability.

Meaning of Stability and Instability

Stability in both the real and monetary sectors means that the IS and LM functions remain in the positions they are expected to occupy and do not fluctuate away from or around their expected positions. For the IS function to be stable, policymakers must know the precise levels of investment that investors plan at various interest rate levels, as well as the precise amounts of consumption and saving that consumers and savers plan to undertake at various income levels. For the LM function to be stable, policymakers must know the precise quantities of money demanded at various interest rate and income levels.

Instability in the monetary sector means that the LM function fluctuates around its expected position. That is, for various rates of interest, equilibrium income levels fluctuate above and below expected levels of income. Instability in the LM function arises when policymakers do not know the precise quantities of money balances that are demanded at various interest rate and income levels. Thus, they do not know, for various rates of interest, the precise levels of income that are consistent with equilibrium in the monetary sector of the economy. However, while policymakers are uncertain about the precise position of the LM function, they can estimate its expected position. That is, for various interest rate levels, they can estimate the levels of income that are expected to be consistent with monetary sector equilibrium.

Instability in the real sector means that the IS function fluctuates around its expected position. Instability in the IS function arises when policymakers do not know the precise amounts of investment that are planned at various interest rate levels or the precise amounts of consumption and saving that are planned at various income levels. Thus, policymakers do not know, for various interest rate levels, the precise levels of income that are consistent with equilibrium in the real sector of the economy. However, while policymakers are uncertain about the precise position of the IS function, they can estimate its expected position.

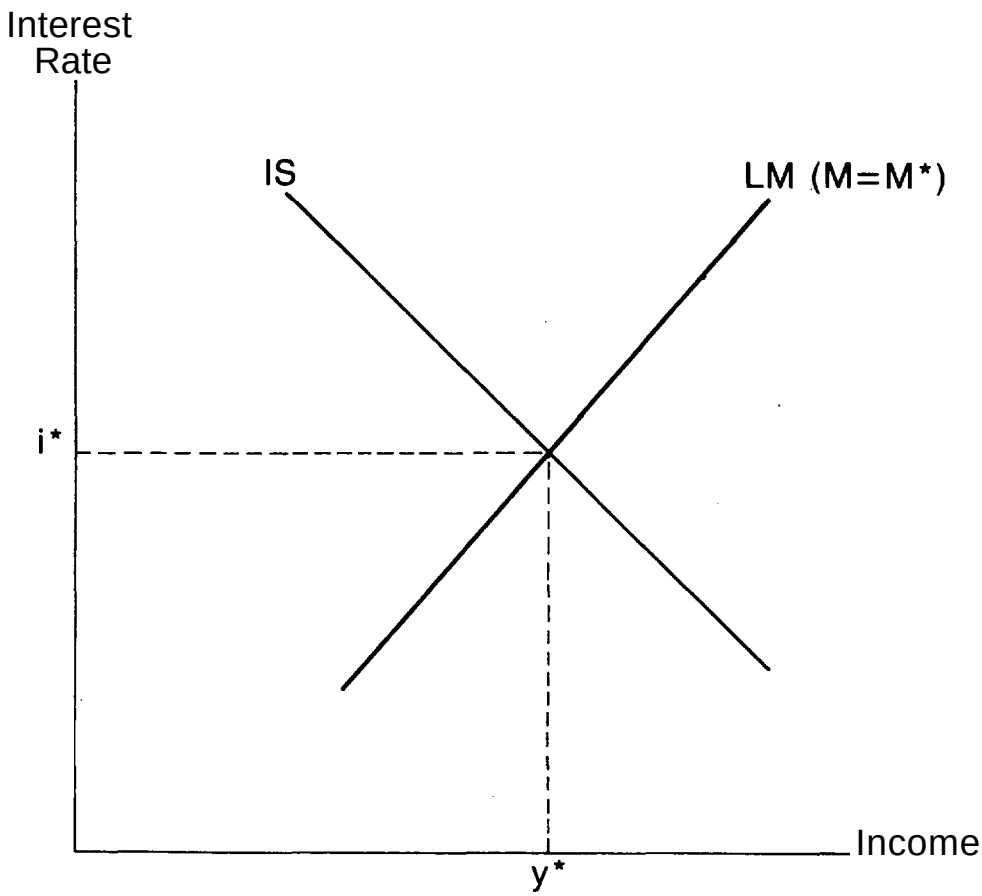
Instrument Choice Under Stable Conditions

If both the monetary and real sectors are stable, neither an interest rate policy nor a money supply policy is preferred. Both policies are equally good because the target level of income is achieved by using either the interest rate or the money supply as an instrument variable.

Under stable conditions, an interest rate policy maintains the interest rate at that level associated with the target level of income, as indicated by the IS function. This is the interest rate that leads to a level of investment sufficient to generate the target level of income. The "maintained" interest rate level may be designated as i^* and the target level of income may be designated as y^*. (See Figure 5.) By maintaining the interest rate at i^*, the target level of income, y^*, is achieved. (Throughout this article, i^* designates the interest rate that is maintained under an interest rate policy, and y^* designates the target level of income.)

A money supply policy maintains the money supply at the level that causes the LM function to intersect the IS function at the target level of income. This is the money supply that equals the quantity of money demanded when income is at the target level. The maintained level of the money supply may be designated at M^*. As shown in Figure 5, by maintaining the money supply at M^*, the target level of income, y^*, is

Figure 5
STABILITY IN REAL AND MONETARY SECTORS



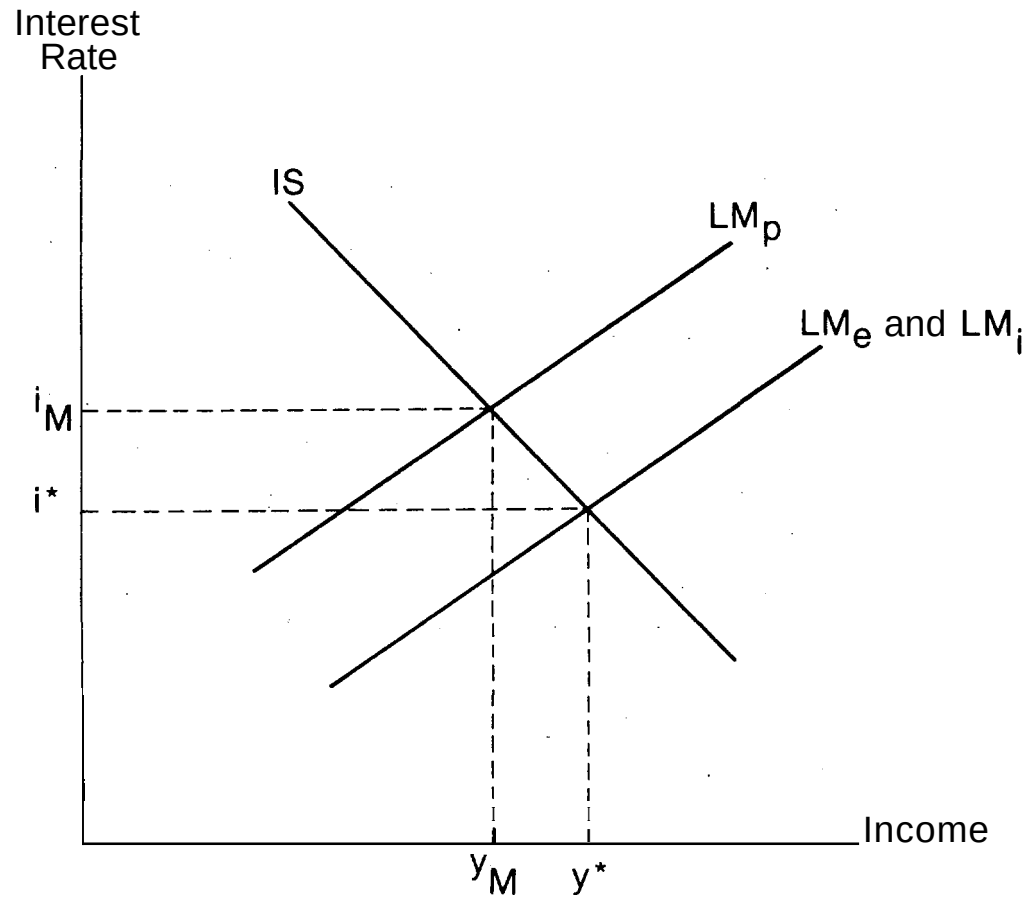
achieved. (Throughout this article, M* designates the money supply that is maintained under a money supply policy.)

To summarize, if both the monetary and real sectors are stable, there is no difference between using the money supply and the interest rate as the instrument variable. Use of either variable achieves the target income level. Moreover, maintaining the interest rate at i* under an interest rate policy results in a money supply of M*—the maintained level under a money supply policy. Similarly, maintaining M* results in i*. In other words, i* implies M* and M* implies i*.

Instrument Choice Under Instability in the Monetary Sector

If the real sector is stable but the monetary sector of the economy is unstable, an interest rate policy is better than a money supply policy. The interest rate policy is better because the target level of income is achieved when using

Figure 6
INSTABILITY IN THE MONETARY SECTOR



NOTE: LM_e represents the LM function that is expected when M* is maintained; LM_p represents the function that may possibly result when M* is maintained; and LM_i represents the function that results when i* is maintained.

the interest rate, but the target income may not be achieved when using the money supply.

Under these conditions of stability in the real and instability in the monetary sectors, an interest rate policy maintains the interest rate at the level associated with the target level of income, according to the IS function. As above, maintaining the interest rate at i* achieves y*.

A money supply policy maintains the money supply at that level that causes the expected LM function to intersect the IS function at the target level of income. However, in this case, maintaining the money supply at M* does not ensure the achievement of the target level' of income because the LM function fluctuates and is unstable, as illustrated in Figure 6. In the figure, the expected LM function is labeled LM_e. The function may fluctuate, though,

possibly shifting "leftward" to LM_p. (Throughout the remainder of the article, LM_e indicates the expected LM function when the money supply is maintained at M*, while LM_p indicates the function that may possibly result when the money supply is maintained at M*.) The leftward shift may be due to economic units temporarily demanding a greater than expected quantity of money balances. If the LM function shifts leftward to LM_p, the level of income achieved by maintaining the money supply at M* is y_p, which is less than y*. Alternatively, the LM function may shift "rightward" due to units demanding a smaller than expected quantity of money balances. In this case (not shown in Figure 6), the achieved level of income is greater than the target level.

In summary, if conditions are stable in the real sector but unstable in the monetary sector, the interest rate is better than the money supply as an instrument variable. Moreover, unlike the previous case, there is a difference between using the two variables. In this case, i* does not necessarily imply M*. Maintaining the interest rate at i* may result in a money supply either above or below M*, as the LM function fluctuates around its most likely position. In the case illustrated in Figure 6 of a leftward shift in the LM function to LM_p—due to a greater than expected demand for money—the money supply that results from maintaining i* is higher than M*. The higher level of money balances (which, under an interest rate policy, holds the LM function at the expected position) is needed to provide for the greater than expected demand for money. Similarly, maintaining the money supply at M* may result in an interest rate above or below i*. In the case of a leftward shift in the LM function, the level of the interest rate that results from maintaining M* is higher than i*. The higher interest rate (designated by i_M) is needed to reduce the greater than expected demand for money balances.

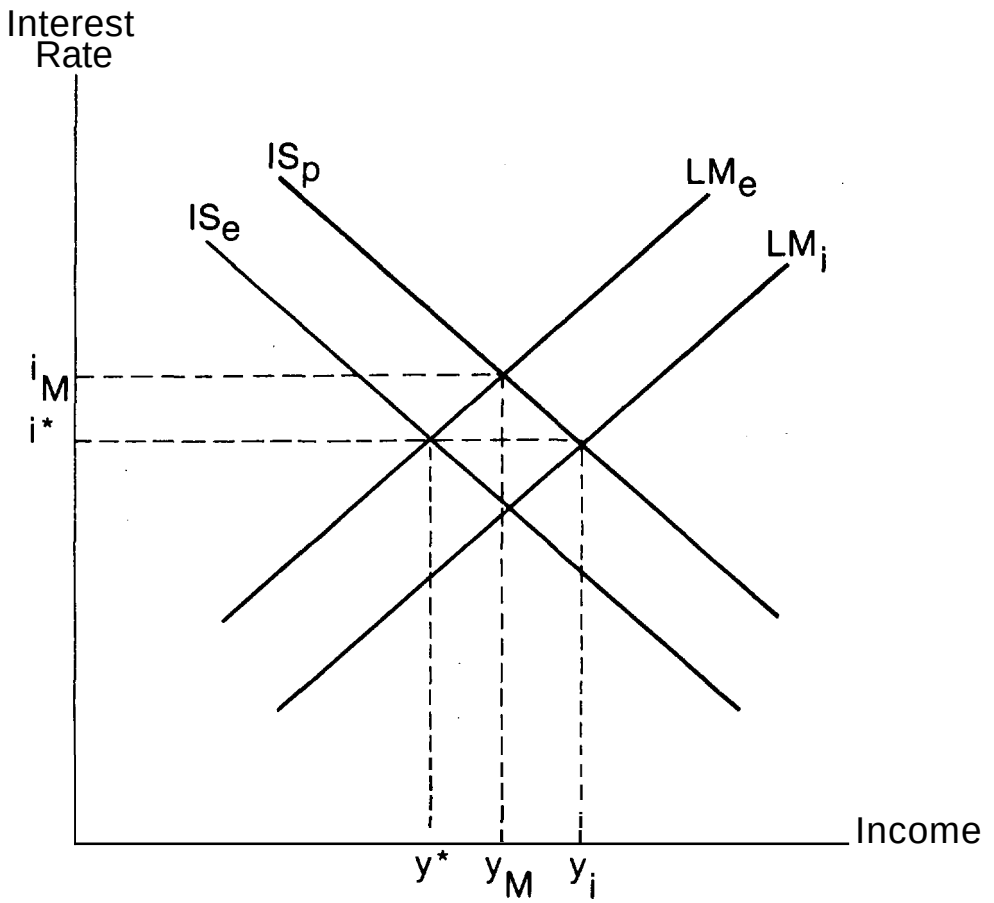
Instrument Choice Under Instability in the Real Sector

If the monetary sector is stable but the real sector of the economy is unstable, a money supply policy is better than an interest rate policy. The money supply policy is better because, while the precise target level of income is not achieved by using either instrument, the divergence between the income level achieved and the target level will be less when using the money supply than when using the interest rate as an instrument variable.

Under conditions of monetary stability and real sector instability, an interest rate policy maintains the interest rate at that level associated with the target level of income as indicated by the IS function, assuming the function occupies its expected position. However, maintaining the interest rate at i* does not ensure achievement of the target level of income. This is because the IS function fluctuates and is unstable, as illustrated in Figure 7. In the figure, the expected IS function is labeled IS_e. The function may fluctuate, though, possibly shifting rightward to IS_p. (Through the remainder of the article, IS_e indicates the expected IS function, while IS_p indicates a possible function.) The rightward shift may be due to economic units temporarily investing more than expected. If the IS function shifts rightward to IS_p, the level of income achieved by setting the interest rate at i* is y_i, which is more than y*. Alternatively, the IS function may shift leftward due to units temporarily investing a smaller than expected amount. In this case (not shown in Figure 7), the achieved level of income is less than the target level.

A money supply policy maintains the money supply at that level that causes the LM function to intersect the expected IS function at the target level of income, assuming the IS function occupies its expected position. However, M* does not ensure achievement of the target level

Figure 7
INSTABILITY IN THE REAL SECTOR

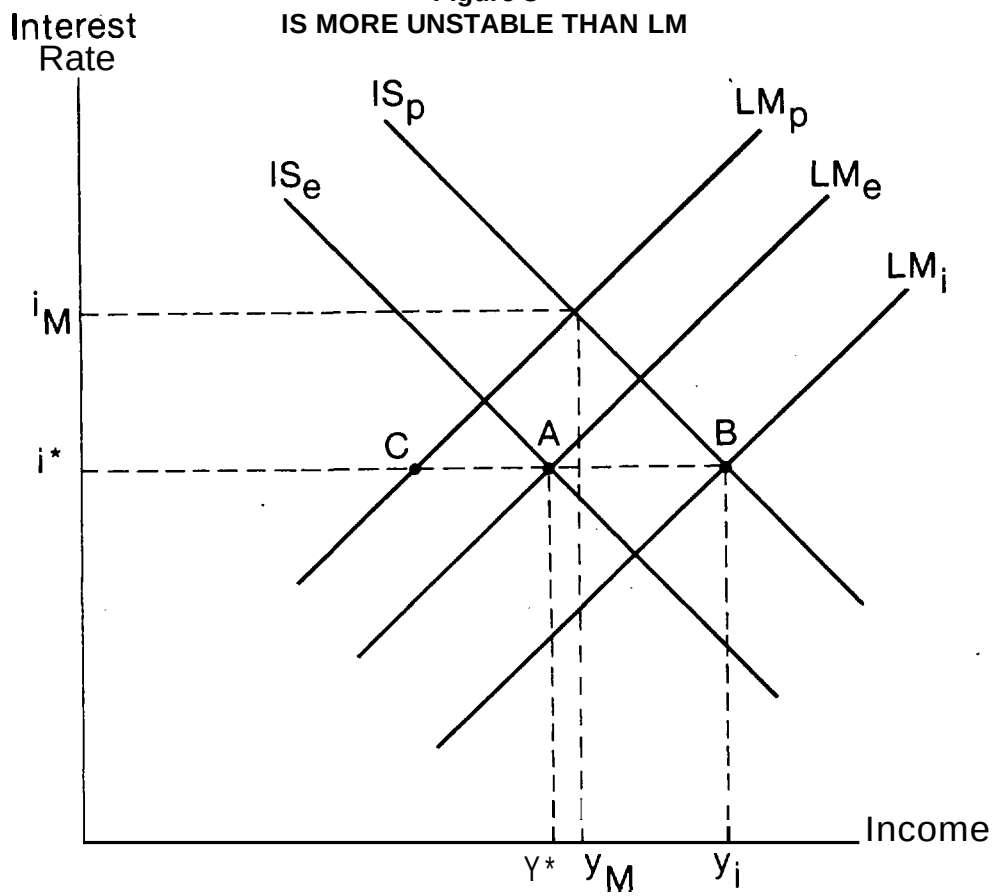


NOTE: LM_e represents the LM function that is expected when M^* is maintained; LM_p represents the function that may possibly result when M^* is maintained; and LM_i represents the function that results when i^* is maintained.

of income because the IS function is unstable. In the case illustrated in Figure 7 of the rightward shift in the IS function to IS_p, the level of income achieved by maintaining the money supply at M* is y_M, which is greater than y*. In the case of a leftward shift in the IS function (not shown in Figure 7), the level of income achieved by maintaining the money supply at M* is less than the target level.

In summary, if conditions are stable in the monetary sector but unstable in the real sector, the money supply is better than the interest rate as an instrument variable because the divergence between the achieved level of income and the target level is less when using the money supply than when using the interest rate. The smaller divergence is illustrated in Figure 7, which shows' that the difference

Figure 8
IS MORE UNSTABLE THAN LM



NOTE: LM_e represents the LM function that is expected when M* is maintained; LM_p represents the function that may possibly result when M^* is maintained; and LM_i represents the function that results when i^* is maintained.

between y* and y_M—the level of income achieved when using the money supply—is less than the difference between y* and y_i—the level of income achieved using the interest rate. Moreover, there is a difference between the two policies, as i* does not imply M* and M* does not imply i*. Maintaining the interest rate at i^* may result in a money supply either above or below M*, as the IS curve fluctuates around its most likely position. Similarly, maintaining the money supply at M* may result in an interest rate either above or below i*.

Instrument Choice Under Instability in the Real and Monetary Sectors

If conditions are unstable in both the real and monetary sectors, either the interest rate or the money supply may be the best instrument variable, depending on certain factors. One factor is the relative instability of the IS and LM functions. As illustrated in Figure 8, a money supply policy is preferred if the IS function is less stable than the LM function. The figure assumes a rightward IS shift and a

leftward LM shift, with the IS shift being more pronounced. The greater IS shift may be verified by noting that the distance between points A and B exceeds that between points A and C. Figure 8 shows that a money supply policy is preferred because the divergence between y* and y_M is less than the divergence between y* and y_i.

Since a money supply policy is preferred if the IS function is less stable than the LM function, the analyst might expect that an interest rate policy is preferred if the LM function is less stable. However, in the case of a less stable LM function, an interest rate policy is not necessarily preferred. The policy choice depends on the extent the LM function is less stable as well as on the slopes of the two functions. Ignoring the slopes, the money supply tends to be the better instrument if the instability of the LM function exceeds the IS function's instability by a small amount. If the excess instability of the LM function is large, however, the interest rate tends to be the better variable.

Figure 9 illustrates the impact on instrument choice of the degree of excess LM instability. The figure assumes a rightward IS shift and two alternative leftward LM shifts. Both LM shifts exceed the IS shift, with the shift labeled LM_p', exceeding the IS shift by a larger amount than does the shift labeled LM_p. (Note that both line segments AC and AD exceed AB.) In the case of the relatively small shift to LM_p, a money supply policy is preferred even though the LM shift exceeds the IS shift. In the case of the relatively large LM shift to LM_p, however, an interest rate policy is preferred.

In addition to stability, the choice of an instrument depends on the slope of the IS and LM functions. The slope of a function refers to the relative changes in the interest rate and income that occur between equilibrium combinations of the two variables. The slope is "steep" if, for any given change in the interest rate, the change in income is small. The slope is "flat" if, for any given change in the interest rate, the change in income is large.

Ignoring the degree of excess instability of the LM function, if the LM function is relatively steep (flat), the interest rate (money supply) tends to be the better variable. The LM function is relatively steep (flat) if the demand for money is relatively insensitive (sensitive) to interest rate changes. Thus, an interest rate (money supply) policy tends to be preferred if the demand for money is relatively insensitive (sensitive) to changes in the rate of interest.

If the IS function is relatively steep (flat), the money supply (interest rate) tends to be the better instrument variable. The IS function is relatively steep (flat) if the demand for investment is relatively insensitive (sensitive) to interest rate changes. Thus, a money supply (interest rate) policy tends to be preferred if the demand for investment is relatively insensitive (sensitive) to changes in the rate of interest.[4]

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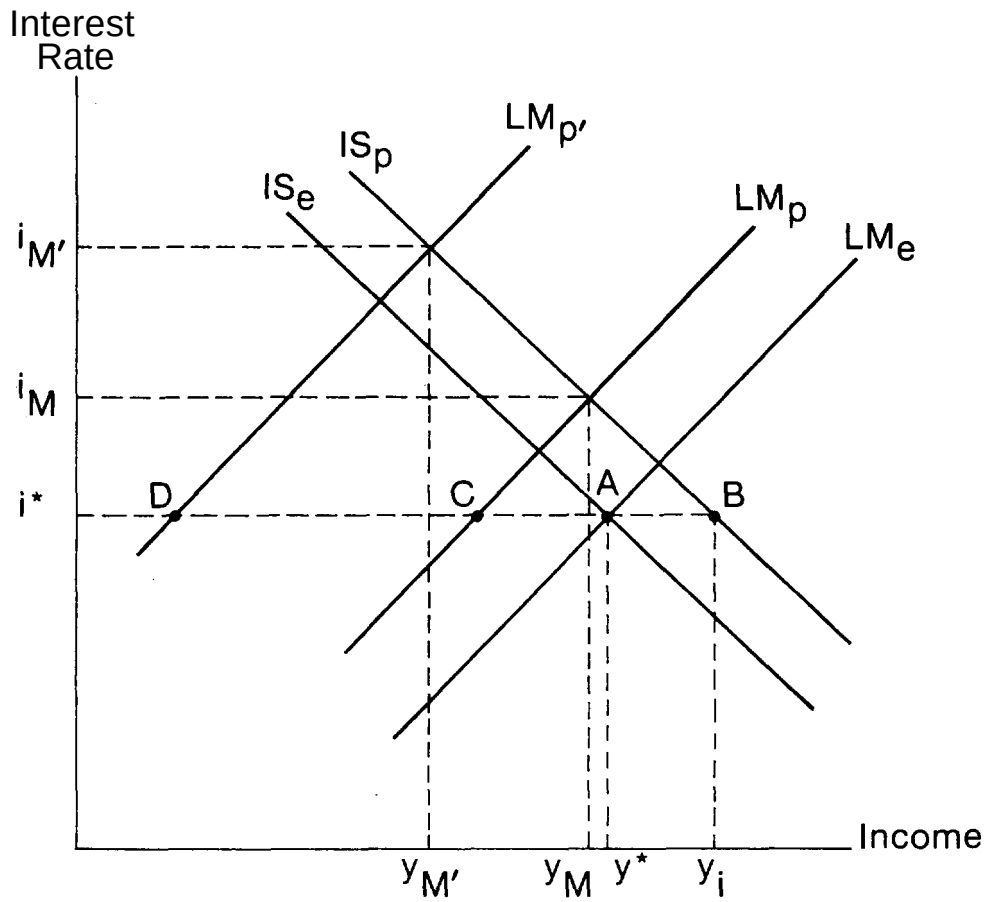
4 The impact on instrument choice of the slope of the LM function can be illustrated by envisaging the impact on y_M of a progressive steepening of the LM function labeled LM_p in Figure 9. The steepening would be shown by a counterclockwise rotation of LM_p around an axis located at point C. As LM_p rotates and becomes steeper, y_M becomes progressively further from y*. This increases the divergence between y_M and y* and increases the likelihood that a money supply policy is inferior to an interest rate policy. (Note that the rotation in LM_p does not affect y_i.)

The impact on instrument choice of the slope of the IS function can be illustrated by envisaging the impact on y_M of a progressive steepening of the IS function labeled IS_p. The steepening would be shown by a clockwise rotation of IS_p around an axis at point B. As IS_p rotates and becomes steeper, y_M becomes progressively closer to y*, increasing the likelihood that a money supply policy is preferred to an interest rate policy. (Note again that the rotation in IS_p does not affect y_i. Also note that at some point, the clockwise rotation of IS_p moves y_M above y* and a further rotation beyond this point Increases the divergence between y_M and y*. However, the divergence cannot exceed the divergence between y* and y_i Thus, it cannot result in conditions whereby an interest rate policy is preferred.)

Figure 9
LM MORE UNSTABLE THAN IS



NOTE: LM_p and $LM_{p'}$ represent functions that may possibly result when M^* is maintained. The function labeled LM_i was not drawn; it would intersect IS_p at point B.

COMBINATION POLICY

This section discusses the possibility that using both the interest rate and the money supply as instrument variables may be preferred to using either one or the other. The use of both instruments is referred to as a combination policy. Under a combination policy — instead of maintaining either the interest rate or the money supply at some specified level — policymakers move both variables in response to shifts in the IS and LM functions.

If precise information is available about shifts that occur in the functions, a combination policy is the preferred policy. For example, in the case illustrated in Figure 9, a combination policy would move the interest

rate above i*, and move the money supply above M*. The policy would achieve the target income level, y*, and would therefore be preferred to an interest rate or a money supply policy. While a combination policy is preferred, its implementation may not be feasible because information about shifts in the IS and LM functions may not be available. An assumption that policymakers have precise information about the shifts is unrealistic and is equivalent to assuming that the functions are stable.

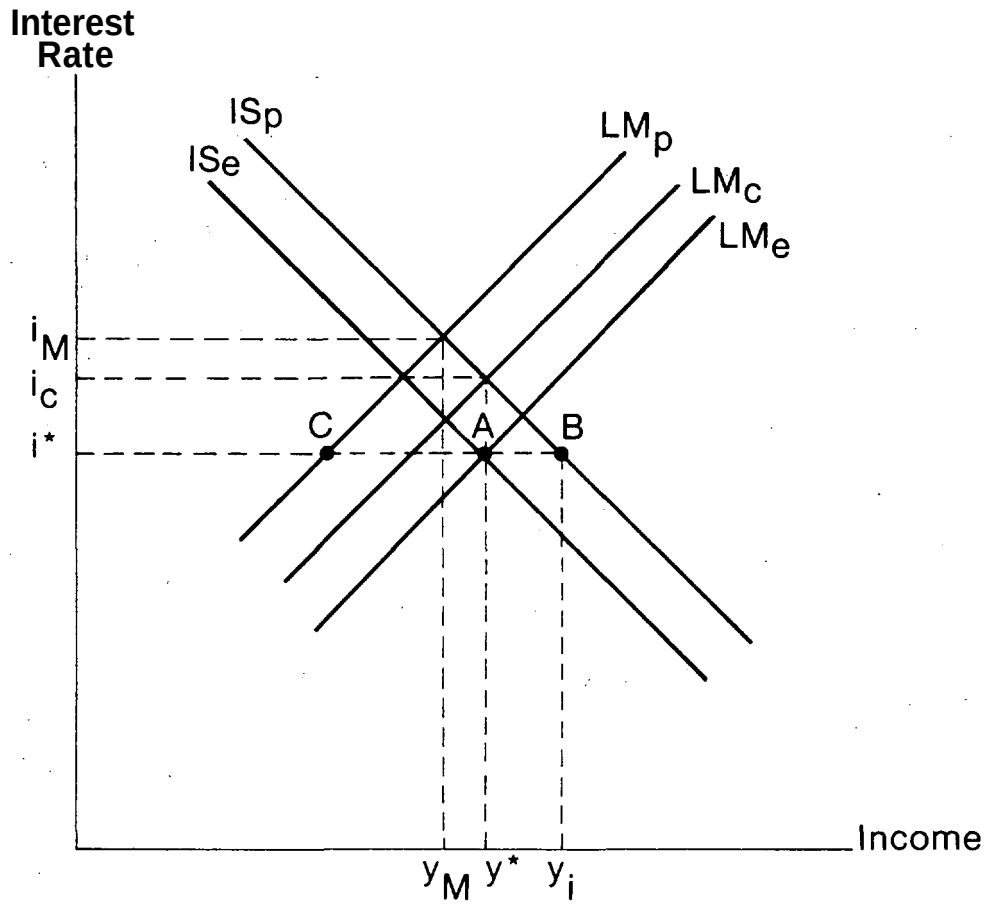
Some information, however, may be available that may possibly allow implementation of a combination policy. In general, three types of information may be available. First, some information is provided by observing the money supply and the interest rate. Thus, observed deviations of the interest rate away from i*, when the money supply is maintained at M*, indicate that the IS and LM functions have shifted. An observed tendency for the interest rate to move above i* indicates a probable leftward shift in the LM function and a rightward shift in the IS function because leftward LM shifts and rightward IS shifts tend to place upward pressure on the interest rate. Similarly, a tendency for the interest rate to move below i* indicates a leftward IS shift and a rightward LM shift.[5]

Information provided by observing the interest rate and the money supply, however, is not sufficient to support implementation of a combination policy. This is because the information indicates only the probable direction of IS and LM shifts and does not indicate their probable extent. For example, upward interest rate pressure may reflect either large IS and small LM shifts or small IS and large LM shifts. A large IS shift would call for a combination policy that moves the interest rate above i* by a large amount, while a small IS shift would call for a policy that moves the interest rate above i* by a small amount. Moreover, no basis would exist for determining the desirable course of action. Thus, information provided by observing the interest rate and the money supply is insufficient to allow the implementation of a combination policy.

A second type of available information may be about the relative stability of the IS and LM functions. For example, past experience may show that one of the functions tends to be more unstable than the other. Under these circumstances, it may be reasonable to assume that the more unstable function shifts more than the other one. This information about the relative stability of the IS and LM functions, along with information provided by observing the interest rate and money supply, may be sufficient to allow the implementation of a combination policy. The implementation may be based on two reasonable assumptions: (1) pressure on the interest rate to move away from i*, when M* is maintained, reflects counterdirectional shifts in the IS and LM functions; and (2) the extent of the shifts in the functions reflect their relative stability, as indicated by past experience. Implementing a combination policy is illustrated in Figure 10. In the figure, when M* is maintained, the interest rate tends to move above i* to i_M. It is assumed that the pressure on the interest rate

5 The assumption that upward (downward) pressure on the interest rate is due to rightward (leftward) shifts in the IS function and to leftward (rightward) shifts in the LM function is based on the reasonable assumptions that some relationship exists between the magnitude of shifts and that small shifts are more likely to occur than large ones. In other words, any given degree of pressure on the interest rate most likely reflects the smallest possible shifts in each of the functions that would be consistent with the relationship and would produce the given degree of pressure. This implies, for example, that any given deviation of the interest rate above i*, when M* is maintained, is more likely to be caused by a small rightward IS shift and a small leftward LM shift than by, say, a large leftward IS shift and a large leftward LM shift.

Figure 10
THE COMBINATION POLICY



NOTE: LM_c represents the LM function that results when the money supply is moved to M_c. LM_i is omitted.

reflects rightward IS and leftward LM shifts, and the LM shift is twice the IS shift. The greater LM shift may be verified by noting that the distance between points A and C on the chart is twice the distance between points A and B. If the functions shift as assumed, the combination policy achieves y* by moving the interest rate to i_c and the money supply to M_c.[6] Thus, the policy would be preferred to either

[6] **The combination policy assumes that the IS and LM functions shift in accordance with the ratio of the variances of the shifts. For a complete treatment of the combination policy, see LeRoy and Lindsey, "Determining the Monetary Instrument," cited earlier.**

an interest rate policy or a money supply policy.

Of course, the combination policy would not always achieve y*. The IS and LM functions would not always shift in accordance with past experience; that is, the two assumptions stated in the preceding paragraph would not always be realized. Nevertheless, the combination policy would be preferred because it would result, on average, in smaller divergencies between the achieved and target income levels than an interest rate or a money supply policy.

A third type of information may be about the behavior of income. While it is unrealistic to assume that the precise level of income is observed during the decision period, some information may be available about the extent that income is deviating from the target level. Suppose, for example, that information is available to indicate that income is falling below the target level. Also, assume that the LM curve is known to be more unstable than the IS curve, and that the interest rate tends to move above i* when M* is maintained. Under these circumstances, as above, it is reasonable to assume that the IS curve has shifted rightward and the LM curve has shifted leftward, with the LM shift being more pronounced than the IS shift. In this case, though, the assumption of the leftward LM and the rightward IS shifts is solidified by the observation of a shortfall in income below the target level because these shifts tend to reduce income while opposite shifts tend to increase income. Thus, a combination policy may be implemented with increased confidence.

CONCLUSIONS

This analysis of the choice of a monetary instrument leads to several conclusions. One is that the choice depends importantly on the relative stability of the relationships among economic variables. The money supply tends to be better than the interest rate as a monetary instrument to the extent that the demand for money function is stable and the demand for investment and the saving functions are unstable. The interest rate is better to the extent that the demand for money function is unstable and the demand for investment and the saving functions are stable.

Another conclusion is that instrument choice also depends on the sensitivity of the demand for money and investment to changes in the rate of interest. The money supply is the better instrument variable to the extent that the demand for money is sensitive and the demand for investment is insensitive to changes in the rate of interest. The interest rate is better to the extent that the demand for money is insensitive and the demand for investment is sensitive to changes in the rate of interest.

A third conclusion is that a combination policy—using both variables as instruments—may be more effective than using either the money supply or the interest rate. The combination policy is better to the extent that information is available on the extent of stability in the relationships among economic variables and on the current behavior of economic variables.