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MONETARY SOURCES OF INFLATION IN SAUDI ARABIA

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Saudi Arabia's great oil wealth has provided the country with a unique opportunity to help its citizens achieve a better life. However, along with this opportunity, oil wealth has created some problems. Specifically, it has contributed to a substantial rate of domestic inflation. Some Saudi Arabians believe that, at the current price of oil, the country's reasonable investment and consumption needs could be met with the revenue from no more than 4 million barrels per day of oil production. As this level of output is less than half the current level of output, it could lead to a substantial increase in the price of oil. This presents the country with a dilemma. A more prudent and efficient level of spending which would match its absorptive capacity would require considerably less oil revenue than is currently being earned. On the other hand, a lower level of oil production would be disruptive to the world economy in which Saudi Arabia has an important stake.

Conceptually, revenues in excess of spending should not be a problem. The excess revenue can be invested in foreign assets whose risk is low and on which interest is paid. The decision as to how much oil to produce and how much excess revenue to acquire should depend on whether the interest rate on holding foreign assets gives a better or worse rate of return than holding oil in the ground, i.e., the decision should depend on whether the future price of oil will change by more than the current level of interest.[1]

At the practical level, however, the excess of revenue over spending creates major problems. All oil revenues accrue directly to the government, and the only way that individual citizens can benefit is through the government's budget-spending decisions.[2] When the budget is in substantial surplus there is, as in most countries, a strong incentive to increase spending. As a result, the number of projects proposed in the budget can easily exceed the number which can be carefully planned, and projects may tend to be more elaborate and costly than would otherwise be the case. At the same time, the resulting increase in aggregate demand leads to a higher inflation rate. This article will analyze the causes of inflation in the unique Saudi Arabian context where

1. Real income is dependent (at this point in time) upon the ability to import goods and services, rather than the ability to produce goods and services (other than oil);

2. Government spending, even with a budget surplus, can still imply stimulative fiscal policy because most government revenue comes from abroad; and

3. Stimulative fiscal policy leads directly to an increase in the money supply because of the underdeveloped state of the financial markets.

Section I briefly reviews the monetary theory of inflation, which argues that the dominant cause of inflation is the growth in the nominal money supply in excess of the real money demand. Section II considers the proper definition of money in the institutional setting of Saudi Arabia. It concludes that currency has the most stable demand function and, therefore, is the best measure of money for central-bank control. Section III looks at the empirical relationship between money and prices, and shows that currency provides the best empirical explanation of inflation. Section IV analyzes the balance sheet of the Saudi Arabian Monetary Agency (SAMA), and shows the unique relation which exists between government spending (not the budget surplus or deficit) and the growth in currency because of (1) the foreign source of most government revenue and (2) the absence of a well-developed financial market. Section V continues the analysis of the SAMA balance sheet, and suggests several ways in which the growth in money can be controlled. Section VI provides a detailed summary and conclusion. The non-specialist may wish to go directly to Section VI.

I. Theoretical Link Between Money and Prices

In the last few years, the central banks of a number of industrial countries have been setting targets for the growth rate of the money supply. In general, the targets are set over a period of a year or more. The rationale for targeting the money supply is based on the following arguments: 1) central banks have considerable control over the money supply, in the long run, through the use of a standard set of central-bank monetary tools; 2) the use of interest rates as a policy guide is unsatisfactory in the current period of high inflation because a change in interest rates may be more related to changes in inflation expectations than to current actions of the central bank.

In its simplest form the link between money and prices can be stated in the following equation:

$$\dot{P} = \dot{M}S - \dot{m}d^*$$

Where the rate of inflation ($\dot{P}$) is equal to the difference between the growth in *nominal* money supply ($\dot{M}S$) and the real demand for money ($\dot{m}d^*$). When the growth in nominal money supply equals that in real money demand, prices are stable.

In most theoretical models, the money supply is assumed to be determined by the central bank. The real demand for money, on the other hand, depends on the behavior of the public. When the central bank permits the nominal money supply to grow faster than the public's real demand for money, an excess supply of money is created. This is eliminated by an increase in nominal demand for money through a rise in the general price level, i.e., inflation.

Conceptually, the real demand for money is made up of two elements: 1) a transactions demand associated with real income, and 2) a financial demand associated with developments in financial markets, interest rates and perhaps changes in financial regulations.

If it is assumed that the transactions demand for money is equal to unity—i.e., a one-percent change in real income leads to a one-percent change in real demand for money—then the structural changes in the real demand for money will be associated with the financial motive rather than the transactions motive.[3] A period of rapid financial innovation or financial growth can lead to a major change in financial demand for money. Also, changes in the government's regulatory environment can have unexpected effects on the demand for money.[4] This suggests that the best measure of money is one which is dominated by the transactions motive rather than the financial motive, because without such a stable and predictable demand, the consequences of the money supply on inflation become uncertain. (This will be discussed further in Section II.)

The other issue to be considered is the degree to which the central bank can actually control the nominal money supply. *Ceteris paribus,* this is directly proportional to the central bank's ability to control its balance sheet. When it purchases an asset it pays for it by issuing liabilities, which are in effect costless to the monetary authorities. This is because of the central bank's government-mandated right to print money, which is costless except for a very modest printing charge. The process operates directly when the central bank pays for assets with currency. The process is indirect when the central bank pays for assets by writing a check against itself, thereby creating a deposit which can only be withdrawn in the form of currency. The degree of central-bank control of money depends upon the degree to which the central bank can determine the amount of its purchases and sales of assets. To the extent that other institutions determine the size of changes in central-bank assets and liabilities, monetary control is transferred to those institutions. (This will be discussed further in Section IV.)

To summarize, the role of the money supply in determining inflation is now well accepted in the economics profession: the link operates through the differences between *nominal* money supply and *real* money demand. Money demand depends upon the behavior of the public; money supply depends upon the behavior of the central bank. In choosing a monetary target, the central bank attempts to determine a) which measure of money has the most stable demand function, and b) which measure it can most easily control.[5]

We will deal with the stability of money demand in the next Section, and with controlling the money supply in Section IV.

II. Which Money to Target?—A Stable Demand Function

International Monetary Fund statistics present three alternative measures of the money stock in Saudi Arabia: currency in the hands of the non-bank public (M_0), currency plus demand deposits of the public at commercial banks (M_1), and currency plus all deposits of the public at commercial banks (M_2).[6]

U.S. readers may find the distinction between M_0 and M_1 artificial. However, in the Saudi context the distinction between currency and demand deposits is significant. Salaries are paid in currency; virtually all household spending is transacted in currency; small businesses pay for their supplies in currency. Interest payments on deposits are legally prohibited.[7] Many citizens will hold demand deposits for their convenience and security, but will not hold time and savings deposits because such deposits imply an association with interest payments. As a result, demand and savings deposits are held for similar reasons, which are quite different from the transactions motive associated with holding currency.

In principle, the central bank should target the monetary aggregate with the most stable or predictable demand function. There are two elements which make up the real demand for money:

1) Transactions demand for money, determined by growth in real income; and

2) Asset demand for money, determined by a) financial developments, and b) interest rates, which measure the opportunity costs of holding non-interest-earning money balances relative to holding interest-earning financial assets or income-earning real assets.

A rise in real income would clearly *increase,* while a rise in the interest rate would clearly *decrease,* the real demand for money. Financial innovations could have an uncertain effect on demand for money. Innovations which increase the demand for currency or deposits would lead to an increase in money demand, while innovations which lead to an increase in the demand for other types of financial instruments could work in the opposite direction. In the U.S., financial developments have tended to reduce the demand for money. In Saudi Arabia, however, financial developments have tended to increase the demand for money because they have primarily benefited deposit-accepting financial institutions.

The standard way to test for stability in the real demand for alternative measures of money is to estimate a money-demand equation. This would be done by constructing a data set with an empirical proxy for each of the theoretical sources of demand described above, and then estimating the appropriate equations. The analysis of the statistical properties of the estimated equations would provide a basis for judging which definition of money is most stable.

In the present case, data limitations make the standard approach unfeasible. Therefore, money demand will be analyzed qualitatively rather than quantitatively.[8] Transactions demand provides the centerpiece in the demand for money in a rapidly growing economy such as Saudi Arabia. As a first approximation, transactions demand is assumed to be directly proportional to the volume of private transactions as measured by real non-oil GDP. For every 1-percent increase in real GDP, the real transactions demand for money will increase by 1 percent (see footnote 3). In Saudi Arabia, where oil income accrues directly to the government and is a significant portion of GDP, the private transactions demand for money is more appropriately measured by the level of non-oil income. This is the income which accrues to the private sector directly through payments of wages and other income sources. This income obviously is strongly influenced by the government oil income via the increase in government spending.

Actual money balances may not always equal desired money balances because of the lag in the adjustments between money and income. This lag can be especially important when both money and income values are accelerating at a rapid rate. Saudi Arabia provides a good example of this relationship (Table 1). Between Hijra years 1390 and 1397—approximately equal to the Gregorian years 1970 and 1977—the currency/income ratio increased 63 percent. However, the ratio increased only 8 percent when measured with a one-year lag between the increase in currency and the adjustment in income.

Considerable empirical work, covering both developed and developing countries, suggests that changes in desired money balances generally adjust to changes in actual money balances with a one-year lag. Table 1 and Chart 1 indicate that, with this one-year lag, the demand for *currency* is very close to unity and thus is almost entirely associated with transactions motives, while the demand for M_1 and M_2 is much greater than unity and thus is strongly influenced by financial developments. As the data show, the currency-income ratio increased very little over the past seven years, while the other two money-income ratios both increased more than 50 percent.

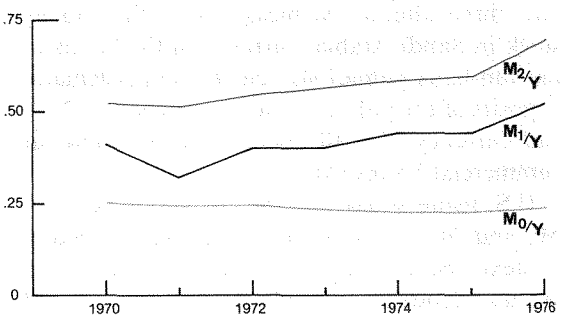
While the stability of the currency/income ratio suggests a pure transactions motive, its high level suggests the presence also of some non-transactions motive. Holding more than 25 percent of annual income in the form of currency seems excessive, especially in view of the fact that the currency/income ratio is stable at around 10 percent in most other countries—both developed and developing. Whatever the non-transactions motive for holding currency, however, it appears to be proportional to the transactions motive and unrelated to changes in financial institutions. Thus as a practical matter, we can treat currency as if it were dominated by a pure transactions motive.

Dr. Omar Chapra, Economic Advisor to the Saudi Arabian Monetary Agency (SAMA), also argues that the demand for currency has been strongly influenced by non-transactions factors. In his view, currency is held for its own sake as a store of value in a period when the Saudi Arabian economy is growing rapidly. The currency supply rises in response to increased government spending, partially because salaries—which rise

Table 1
Ratio of Money to Non-Oil Income

	Hijra	M_0/Y	M_1/Y	M_2/Y
Ratio	1390 (1970)	.27	.42	.57
	1397 (1977)	.44	1.02	1.23
Percent change (1390–97)		63%	143%	116%
Ratio (lagged one year)	1390 (1970)	.26	.41	.53
	1397 (1977)	.28	.63	.81
Percent change (1390–97)		8%	54%	53%

Chart 1
Ratio Of Money To Non-Oil Income



almost every year—are paid in currency. According to this argument, the public responds by passively increasing the share of assets held in the form of currency—as is seen from the 120-percent increase, from 15.5 riyals to 34.0 riyals, in the average denomination of currency in circulation in the decade ending in Hijra year 1395 (approximately 1975).

While acknowledging that there is a non-transactions element to currency demand, we believe it is not passive. Rather, it is proportional to the transactions demand. For support, we may point to two pieces of evidence which tend to disprove the existence of an independent non-transactions component to currency. First, the ratio of currency to non-oil income has remained remarkably stable in the face of a very rapid rise in currency. Second, the average currency denomination has increased only 120 percent, in comparison to a 190-percent increase in the price level, over the past decade. The fact that the currency denomination went up less rapidly than the rate of inflation suggests that households are not hoarding currency at any greater rate—relative to income—than in the past. Thus any currency hoarding is apt to be only temporary, as reflected in the one-year lag between currency and income shown in Table 1. As soon as households find more profitable alternative uses of funds, they shift their demand to such alternative uses.

Most studies of currency hoarding done elsewhere suggest that the primary non-transactions demand for currency relates to avoidance of taxes and other Government restrictions on private exchange. But the Saudi economy has no

significant taxes and is extremely open and free with respect to private transactions. So this incentive to hold a significant portion of wealth in the form of currency does not exist.

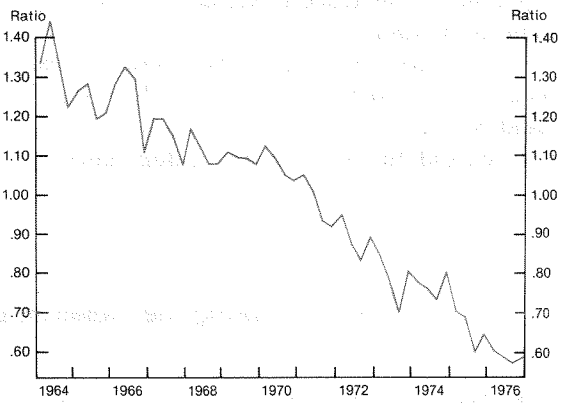
The same type of evidence, however, would suggest that there is a strong non-transactions motive in the demand for M_1 and M_2. As we have seen, the growth rate for both monetary aggregates was more than 50 percent greater than the growth rate of nominal income over the past seven years. The growth of those aggregates apparently was related to increased demand for financial assets in excess of the growth of real income, i.e., financial deepening. Otherwise, the inflation-stimulated growth of nominal income would have been larger than actually observed, so that the ratio of money to income would have remained relatively stable as in the case of currency. The sharp rise in M_1 and M_2 balances relative to income, or to put it another way, the fall in velocity, suggests that the demand for deposits rose substantially faster than transaction needs would suggest in the last seven years.

Additional evidence can be found in the movements of the currency ratio, which reflects the relative demand by households and firms for currency and deposits (Chart 2). In 1964 the average private Saudi held approximately 1.3 riyals of currency for every riyal of deposit, but this ratio declined by half by 1976. This suggests a strong shift in the preferences of Saudis towards holding financial assets relative to currency. This is a natural consequence of financial deepening, as households increase their proportion of savings in the form of financial deposits rather than as currency.

Nonetheless, the relative importance of financial and transactions demands for money does not help us select an appropriate measure of money. That choice does not depend on the array of motives which influence the demand for money, but rather on our ability to forecast its movement over time.

The financial demand for money has been growing much more rapidly than the transactions demand because of a major change in the perceptions of the average Saudi regarding financial institutions. Along with the recent rapid growth in wealth, there has been a remarkable change in the desired composition of wealth

Chart 2
Currency Ratio*



*Ratio of currency to deposits.

holdings. The traditional forms of wealth—gold, silver and jewelry—are being supplemented with financial wealth in the form of domestic deposits and foreign securities.[9]

The average rate of growth in real financial assets (i.e., deposits) has been very rapid, and has also varied considerably over time. For example, from 1974 to 1977 the money-income ratio increased between 0 and 36 percent per year for M_1, and between 1 and 24 percent per year for M_2. In absolute terms, bank deposits have grown between 35 and 105 percent per year. This wide variance in the rate at which the private sector acquires financial assets is not surprising for a small country which possesses a rudimentary financial system and which is undergoing a period of major expansion and transformation.

Shifts in government regulation can also affect the rate of growth in the demand for financial assets. For example, a rise in reserve requirements increases the cost to commercial banks of acquiring deposits, so that they tend to offer a lower rate of return (either in services or convenience) to depositors and, thus, discourage the public from investing its savings in this financial form. At the same time, the banks are forced to charge relatively high fees for making loans, which discourages potential investors from using bank services in meeting their needs. Saudi Arabia's dramatic increase in reserve requirements in 1973 (discussed below) slowed financial

development for several years. By the same token, the reduction of current high reserve requirements could accelerate financial development in the future.[10]

In summary, this section shows that the real demand for currency (not surprisingly) is dominated by transactions considerations, while the real demand for M_1 and M_2 is dominated by financial considerations. If, as seems likely, Saudi Arabia's financial markets continue to develop rapidly, but at an irregular and unpredictable rate, then the real demand for currency will be more stable and thus more predictable than the real demand for M_1 or M_2. This suggests that currency is the most appropriate central bank target for controlling the rate of inflation.

III. Estimating the Relation Between Money and Prices

In Section I we showed that the relation between money and prices takes the following form:

$$\dot{P} = \dot{MS} - \dot{md}^*$$

The inflation rate ($\dot{P}$) is equal to the difference between the growth in the *nominal* money supply ($\dot{MS}$) and *real* money demand ($\dot{md}^*$).[11] If the real money demand is unstable, then the relation between $\dot{MS}$ and $\dot{P}$ would be less predictable.

In Section II we showed that the available evidence (although fragmentary and incomplete) suggested that the demand for currency was the most stable of the alternative measures of money. In this section, we will attempt to measure the relation between the growth of currency (M_0) and the inflation rate. In the Appendix, we present similar measures of the link between M_1 and M_2 and inflation.

The data problems which made it difficult to perform standard statistical analysis of the demand for money are not as serious in this case. Money stock and price data for Saudi Arabia are available, on a quarterly basis, for the period 1964 to date, which provides a long enough run of data for statistical regression analysis. The simplest initial test is to compare changes in the nominal stock of currency with changes in the consumer price index. Because it takes some time for the price of goods to adjust to a change in the stock of currency, the equation is estimated with a lag—specifically, a 12-quarter distributed lag, on the basis of the price experience of the U.S. and other countries. (All equations are estimated with a second-degree polynominal distributed lag to conserve degrees of freedom.)

$$(\dot{CPI}) = -3.3 + \sum_{(2.4)}^{12} 0.83\ (\dot{M}_0)_{(13.4)}$$

$R^2 = .83$ DW = .64
SE = 5.25 DF = 37 (1)

($\dot{CPI}$) is the rate of change of prices, and ($\dot{M}_0$) is the rate of change of currency. The estimated coefficient linking currency and prices is equal to 0.83 (see box). Thus, for every 1-percent increase in the growth of currency ($\dot{M}_0$) over the past 12 quarters (3 years), there is approximately an .83-percent increase in the consumer price index (CPI).[12] However, the low DW statistic (0.64) suggests that one or more important variables have been omitted in the explanation of inflation. Economic theory suggests two other possible influences: 1) the real transactions demand for money associated with the growth of real income, and 2) the effects of world inflation on domestic inflation.

Real demand for money. As discussed above, a rise in the money supply associated with an equal proportional rise in real demand for money will have no impact on the domestic inflation rate. The equation as estimated above implicitly allows only for a constant growth in the real demand for money. Given Saudi Arabia's substantial increase in real income since 1973, this is a significant omission. The problem arises because there are no reliable data, other than post-1970 annual data, to measure changes in non-oil real income. Attempts to translate annual data into quarterly approximations have not led to statistically significant results. Thus, the real-demand variables cannot be explicitly introduced into the empirical model at this point. An

indirect method of dealing with this problem will be discussed below.

World inflation. Saudi Arabia is a very open economy with imports (including government imports) representing a significant share of total spending. For that reason, some would suggest that the domestic inflation rate is primarily determined outside the Kingdom. This proposition would seem to be overstated, especially with respect to the consumer price index. Even if all goods were imported, domestic prices would not be completely determined by world prices because imports are a "joint product," of imported goods and domestic services. When an imported good is sold to a Saudi national, he is purchasing not simply that good but also the domestic value added in the form of port deliveries, internal transportation, and wholesale and retail marketing. Thus, the goods component of the CPI represents a weighted average of foreign and domestic value added. This said, it must nevertheless be recognized that the Saudi Arabian economy is strongly influenced by the inflation rate in the rest of the world, especially given the relatively fixed nature of the Saudi Arabian exchange rate with respect to the U.S. dollar.[13]

As one of the authors has shown, the world inflation rate can be measured on the basis of export prices of the major industrial countries from monthly IMF statistics.[14] This index is in dollars, which in the Saudi Arabian context is a reasonable first approximation of world inflation. A second equation was estimated with both the world inflation rate ($\dot{Pw}$) and Saudi Arabian currency growth ($\dot{M}_0$) as explanatory variables for the domestic inflation rate ($\dot{CPI}$). The results are summarized below.

$$\dot{CPI} = \underset{(5.6)}{-5.2} + \sum_{(8.0)}^{4} 0.51(\dot{Pw}) + \sum_{(16.0)}^{12} 0.70\,(\dot{M}_0) \qquad (2)$$

$R^2 = .94$ DW = 1.62
SE = 3.24 DF = 35

In this equation, every 1.0-percent increase in world inflation over the previous four quarters had approximately a 0.51-percent effect on the Saudi Arabian price level.

The addition of the world inflation variable ($\dot{Pw}$) substantially improved the statistical properties of the equation. The R^2 which measured the explained variance in ($\dot{CPI}$) increased from 83 percent to 94 percent. The standard error fell from 5.25 percent to 3.24 percent. Most important, the DW statistic increased from 0.64 to 1.62. This substantial fall in systematic error strongly supports the inclusion of ($\dot{Pw}$) as an important factor in explaining inflation in Saudi Arabia.

Statistical Properties of Equation 1.

R^2 is the coefficient of determination. The .83 means that 83 percent of the variation in ($\dot{CPI}$) is associated with variation in ($\dot{M}_0$) over the past 12 quarters. SE is the standard error, which states that the predicted value of ($\dot{CPI}$) is within 5.25 percentage points of the actual value 66 percent of the time, i.e., plus or minus one standard deviation. DW is the Durbin-Watson statistic, which tells whether the error between actual and forecast value is systematic. If the errors are random, the DW statistic would approach 2.0. A value of .64 suggests that these errors are systematic, and that some other factor not in the equation systematically affects ($\dot{CPI}$). DF is the degrees of freedom. This equals the number of observations (40) minus the number of degrees of freedom used in estimating the equation (i.e., one plus the number of independent variables). If lags are used so that some variable affects the ($\dot{CPI}$) more than once, more than one degree of freedom is used. The number depends not on the length of the lag (12 quarters) but rather on the degree of the polynominal (2nd degree). In equation 1, DF = 40−3 = 37. The bracketed number ( ) below the coefficient is a "t" value, which indicates the degree of confidence that the estimated coefficient is significantly different from zero. A "t" value of 1.95 corresponds to the 95-percent confidence level. A "t" value of 13.4 is very significant.

It is interesting to note that while the coefficient value on domestic currency declined somewhat (from 0.83 to 0.70), the statistical significance of that coefficient increased. (The "t" statistics went from 13.4 to 16.0). As shown in Chart 3, the estimated values of $(\dot{CPI})$ matched the actual inflation rather closely. The actual inflation rate averaged below 5 percent per year through 1972, but increased sharply in 1973 and 1974 largely because of the rise in $(\dot{Pw})$. However, it continued high in 1975–76, in spite of a substantial fall in $(\dot{Pw})$, because of a rapid acceleration in domestic currency (Chart 6).

These results might be compared with the U.S. 1964–75 experience, where an equation of the same nature was estimated to explain U.S. $(\dot{CPI})$.[15] (See footnote 14.)

$$\dot{CPI} = \underset{(3.9)}{-3.6} - \underset{(5.8)}{3.3}\,DUM + \sum^{4} \underset{(5.3)}{0.16}\,\dot{Pw} + \sum^{12} \underset{(7.4)}{1.49}\,(\dot{M}_1)$$

$R^2 = .87 \quad DW = 1.66$
$SE = 1.11 \quad DF = .41$ (3)

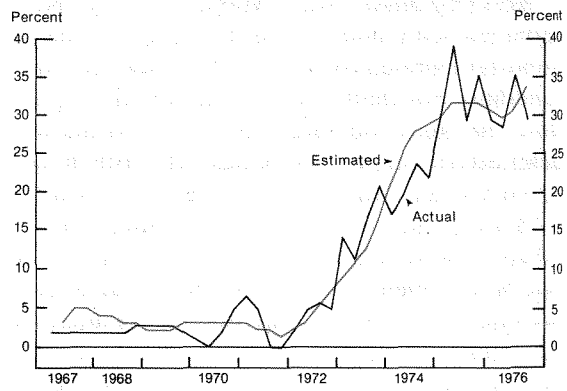
In this equation, every 1.0-percent increase in world inflation over the previous four quarters had approximately a .16-percent effect on the U.S. domestic price level.

As Saudi Arabia is probably one of the most open economies in the world, and the U.S. one of the most closed in terms of ability to provide goods and services from domestic sources—not in terms of protectionism—the range of coefficient values, between 0.16 for the U.S. and 0.51 for Saudi Arabia, may suggest the practical range of world-inflation influences for countries generally. The results suggest that the U.S. cannot ignore world monetary influences on its domestic price level, and conversely that Saudi Arabia cannot ignore domestic monetary influences on its price level.

In spite of the generally superior statistical properties of the second equation (including world prices), it clearly suffers from a number of deficiencies because of the lack of an explicit real-income variable. If one were included, we would expect the constant term to have a value of zero rather than its estimated value of minus 5.2; the monetary coefficient would be approximately 1.0 in value rather than its estimated value of 0.70.

Chart 3

Inflation Rate — Actual and Estimated



Without an explicit income variable, this equation represents only an approximation of the true relationship between world inflation, domestic money and domestic inflation. As such, while it can provide confidence in the importance of the variables being considered, it cannot provide *exact guidance* on setting monetary targets. For example, consider a case where the world inflation rate was zero, and the underlying growth in currency was 50 percent, that is, somewhat below the actual rate of currency growth in 1976. The result would be calculated as follows:

Currency growth		Coefficient value		Constant term		Inflation rate	Implied Real Growth
50	×	.70	–	5	=	30	20
20	×	.70	–	5	=	9	11

A 50-percent increase in the currency supply would suggest approximately 30-percent inflation and a real growth rate of 20 percent. A 20-percent growth in the currency supply would suggest an inflation rate of 9 percent and a real growth rate of 11 percent. This positive trade-off between inflation and real growth is reminiscent of the results described in the Phillips curve literature in the U.S. and U.K. The Phillips curve describes the negative relationship between inflation and unemployment, which is consistent with the positive relationship between inflation and real output growth. Whatever the virtues of the Phillips curve in analyzing countries in the industrial world (and considerable controversy surrounds the stability of that relationship), in the case of Saudi Arabia it is clearly a statistical

artifact. The results reflect the fact that currency, prices and real income have all accelerated together since 1967, the period covered by this equation. This tends to bias the constant term (the real-income proxy) to a negative value, and the CPI inflation/currency coefficient below 1.0. Thus equation 2 cannot be applied "mechanically" to determine the non-inflationary growth in currency.

The discussion to this point would suggest the following conclusions: First, the appropriate monetary aggregate is currency. Second, the non-inflationary growth rate should be established as equal to the growth rate of the real absorptive capacity of Saudi Arabia. That topic is beyond the scope of this paper. However, casual evidence suggests that the absorption capacity of the country has increased substantially in recent years, and is probably in the range of 20-to-30 percent per year in real terms.

IV. Controlling the Money Supply

In this section, we consider what tools the central bank has available to control the monetary aggregates. Money-supply control can be thought of as a two-stage process which is summarized by the following identity:[16]

$$M = m\,(RM) \qquad (4)$$

The money supply (M) is equal to the money multiplier (m), times the level of reserve money (RM). Reserve money is the liabilities of the central bank to the private sector in the form of currency (C) and bank reserves (Rb).

$$RM = C + Rb \qquad (5)$$

The money multiplier (m) is simply the ratio of total money (M) to reserve money (RM).

$$m = \frac{M}{RM} \qquad (6)$$

The broader measure of the money stock is equal to currency (C) plus deposits (D). For M_1 it includes only demand deposits; for M_2 it includes all deposits at commercial banks.

$$M = C + D \qquad (7)$$

By rearranging terms in equations 5 through 7 and multiplying both the numerator and denominator by (D) we get the following extended definition of the money multiplier:

$$m = \frac{M}{RM} = \frac{C + D}{C + Rb} = \frac{C/D + D/D}{C/D + Rb/D} = \frac{k + 1}{k + r} \qquad (8)$$

The currency-deposit ratio (k) describes the behavior of the non-banking public with respect to its desire to hold currency relative to deposits (C/D). (Chart 2) The currency ratio has declined steadily over time. This reflects the incentive of the public to hold an increasing share of its wealth in deposit form rather than in currency form. This is a symptom of financial deepening. The reserve ratio (r) describes the behavior of the banks with respect to their desire to hold reserves relative to deposits (Rb/D).

The total money supply is simultaneously determined by the behavior of the central bank, the commercial banks and the public. The central bank's behavior is summarized by the movements in reserve money (RM); the behavior of the banks and public is summarized by movements in the money multiplier (m). In Saudi Arabia the dominant element behind the growth in the monetary aggregates is central-bank reserve money.[17] In Section II we concluded that currency was the appropriate measure of money for central-bank control. Thus a direct analysis of the money multiplier is not necessary. However, it is necessary to consider control of reserve money as a precondition for control of currency.

Control of Reserve Money

The specific tools of monetary control differ among central banks for reasons which are related to the institutional circumstances of each country. For example, in the United States, with its large and widely-held national debt, the Federal Reserve's dominant tool is buying and selling government securities in the open market (open-market operations). The purchase of government securities adds to Federal Reserve assets and, therefore, increases reserve money. In Japan, with its relatively small national debt, the dominant tool is the discount window. The Bank of Japan adds to its assets by extending loans to

commercial banks, thereby influencing the level of reserve money. Germany, which has neither a large national debt nor heavy commercial-bank indebtedness to the central bank, uses reserve requirements as its dominant tool.

While central banks differ among themselves with respect to the dominant monetary tool, they agree on a common element in defining the degree of central-bank control—that is, their ability to determine the level of reserve money.[18] To the extent that control of reserve money is in the hands of others, effective control of monetary policy lies outside of the central bank.

A central bank's control can be limited by decisions made outside its jurisdiction, in numerous ways. For example, during the 1970–73 period, fixed exchange rates imposed such a limitation on the central banks of Western Europe and Japan. A fixed exchange-rate regime requires that the central bank purchase all foreign assets presented to it at a fixed price in domestic currency. During the period in question, these central banks were forced to purchase large numbers of dollars. This increase in foreign assets led to a parallel increase in reserve money. Because the volume of dollars involved was large, it was impossible to offset the impact and, as a result, the domestic money supply in each of the major industrial countries increased at an unprecedented rate. This was a major contribution to the world-wide inflation of 1973–74.[19]

The ability of the Saudi Arabian Monetary Agency (SAMA) to control reserve money is directly proportional to its ability to control the size of its balance sheet. The two dominant elements in SAMA's balance sheet are foreign assets and government deposits. Considered separately, foreign assets add to reserve money while government deposits reduce reserve money. When they increase together, as they typically do in the first instance, there will be no change in reserve money. Given that foreign assets are determined exogenously (by the price and quantity of oil), and that government deposits are determined exogenously by the budget actions of the fiscal authorities, there may be little room for discretionary monetary policy.[20] This is a clear case where fiscal policy and monetary policy are not separate tools but rather a single tool. Fiscal decisions determine the rate of growth of money in Saudi Arabia.

This should not be interpreted to mean that there are no controls on reserve money. In fact, one automatic mechanism—the link between foreign assets and government deposits—provides a substantial amount of control over the growth of reserve money. In addition, SAMA makes effective use of one major policy tool, reserve requirements.

Automatic Controls

There is a very close link between the growth of foreign assets (FA) and the growth of government deposits (GD), which acts as an automatic stabilizer on the growth of reserve money. In effect, the difference between (FA) and (GD) determines reserve money. As Chart 4 shows, three general observations can be made regarding the movement in reserve money over the 1965–76 period: 1) Changes in foreign assets induce parallel changes in government deposits, the series moving closely together on a year-over-year basis; 2) Foreign assets almost always increase at a somewhat faster rate than government deposits, accounting for the modest growth in reserve money in the 1965–71 period; and 3) a substantial acceleration in foreign assets (as in 1972–73 and 1975–76) is associated with a slowdown in government-deposit growth in the second year of the expansion, so that reserve money tends to accelerate about one year after a sharp acceleration in foreign assets.

This automatic process can be described as an initial injection of reserve money and its offset in a series of leakages. Assume, for simplicity, an initial condition of a balanced government budget, to which is added 1 million riyals of oil revenue. This will initially flow to SAMA as an increase in both foreign assets and government deposits. At this stage, there is no change in reserve money because the transactions are all within the government. However, SAMA's larger government deposits mean that the budget is now in surplus by 1 million riyals. Given the official policy of balancing expenditures and receipts, an increase in government deposits may induce an increase in spending, which transfers government deposits to the private sector in payment for goods and services. The decline in government deposits will lead to an increase in

reserve money in the hands of the public, except to the extent of offsetting leakages. There are three potential leakages associated with 1) purchases of foreign goods and services by the government or private sectors, 2) purchases of foreign assets by the private sector, and 3) purchases of domestic financial assets other than currency by the private sector.

1. Purchases of foreign goods and services. To the extent that government spending involves direct purchases of foreign goods or indirect inducement to the private sector to make such purchases, the effect on reserve money is neutralized because of a parallel reduction in foreign assets. The major constraint here is the technical capacity of the domestic economy to absorb imports without creating bottlenecks. An example is the well-publicized port congestion of 1976, which was successfully eliminated by early 1977.

2. Private purchases of foreign assets. To the extent that government spending leads to an increase in private savings, and thence to purchases of real or financial foreign assets, it will neutralize the effect on reserve money in much the same way as imports. The constraint here is not the technical absorptive capacity of the economy but, rather, the degree to which private Saudi Arabian citizens are willing to hold their assets abroad in foreign-currency form and to accept foreign-exchange risk. This is an especially important constraint in the current environment of uncertainty regarding the international value of major foreign currencies, especially the dollar.

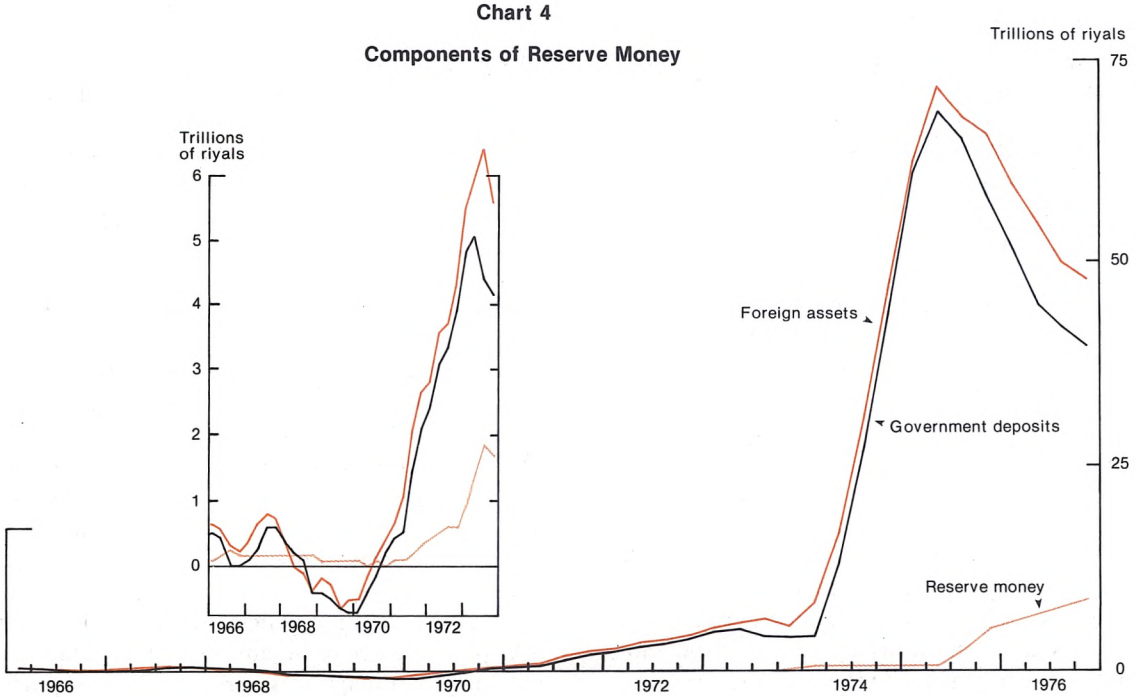
3. Private purchases of domestic financial assets. To the extent that government spending induces increased private savings in the form of domestic financial assets, the decline in government deposits at SAMA will be matched by an increase in bank reserves to support the new private deposits, which is the most likely form in which domestic assets will be held.[21] This would be a leakage only if SAMA acts to control currency—not if it acts to control M_1 or M_2.

The Saudi Budget: Unique Features

This discussion brings out an important and unique feature of the Saudi Arabian Government budget and its relation to monetary policy. Most developing countries with rudimentary financial systems would observe close links between the government budget and the money

Chart 4

Components of Reserve Money



supply. A budget deficit would be financed by borrowing from the central bank, leading to an increase in the money stock. A budget surplus would have the reverse effect. The reason for this close association is that, without a well developed financial market, the only source of financing a deficit or disposing of a surplus is via the central bank's money creating and cancellation process.

Saudi Arabia is similar to other developing countries in terms of its relatively underdeveloped financial markets. And yet in spite of a substantial budget surplus, Saudi Arabia has experienced a large increase in the reserve money and currency issue of its central bank. This is contrary to what would be expected to occur with the large and persistent government budget surpluses which Saudi Arabia enjoys.

The reason is that Saudi Arabia has been running budget surpluses only in a narrow accounting sense—not in a real economic sense. An "economic" balanced budget can be defined as a condition in which the government demand for resources (spending) is equal to the government-induced reduction in demand for resources by the private sector (receipts). In most countries the accounting and economic balanced budget can be treated as identical. This is because government revenues are almost all acquired by levying taxes on domestic individuals and firms. These, in turn, reduce the private demand for resources. If spending is just equal to tax receipts, the central bank will be free from monetizing the budget deficit, and there will be no change in reserve money from this source.

In Saudi Arabia, the accounting and economic balanced budget are different because so large a proportion of government revenue is paid by non-resident foreigners as oil royalties rather than by domestic Saudis in income or sales taxes. In this special case, economic balance is the equality of government spending with imports of foreign goods, services and financial assets. Government spending in excess of these imports would represent a net fiscal stimulation of the private economy, and therefore, would be exactly analogous to a budget deficit in most other countries. This economic deficit is financed under Saudi conditions by central bank monetization, which leads to the rise in reserve money and currency which contributes to the rate of inflation.

In terms of the SAMA balance sheet, government spending appears initially as a decline in government deposits. There would, however, be no increase in reserve money if it were matched by an equal decline in foreign assets of SAMA, i.e., imports of goods, services and foreign assets. Thus, an economic balanced budget in the case of Saudi Arabia would lead to a zero increase in reserve money issued by SAMA. This is precisely the effect of an ordinary balanced budget in most other countries.

Another feature which sets Saudi Arabia apart from other high-income nations, but is common to many developing countries, is the rudimentary nature of its financial system. This has important implications for monetary policy. It means that when Saudi Arabia runs an economic deficit there are relatively few ways in which that deficit can be financed other than via the Central Bank. The ability of government to finance its "deficits" via sales of its own securities directly or indirectly to the private sector is a key element in distinguishing monetary policy from fiscal policy. To the extent that mobilizing private domestic savings is an alternative to monetizing the government's economic deficit, one can distinguish fiscal policy (the size of the deficit) from monetary policy (growth of money supply).

To summarize, we may make the following observations for the Saudi Arabian case:

1) Because of the absence of a well developed financial system, the government budget is the most important factor in determining the growth in reserve money and the other measures of money.

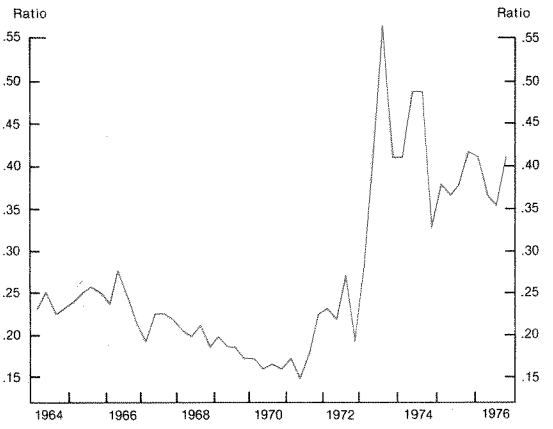
2) Because government revenue comes almost exclusively from abroad rather than from domestic taxes, the appropriate definition of a balanced budget is *not* that spending equals receipts, but rather that spending equals imports of goods, services and foreign assets. Economic consequences exactly analogous to a budget deficit occur in Saudi Arabia when spending is in excess of imports of goods, services and foreign assets.

3) This economic-deficit analogy applies to SAMA. When government spending (decline in government deposits) is greater than imports

(decline in foreign assets) there is an increase in reserve money (see Chart 4). The central bank must monetize government spending in excess of imports.

4) The automatic neutralization of reserve money from government spending via imports is an important source of monetary stability. However, in recent years, the economic deficit has increased as government spending has increased faster than imports. This has led to a significant acceleration in reserve money, currency, and inflation. Thus, it is important for SAMA to have sufficient monetary tools to control the growth in reserve money.

Chart 5
Reserve Ratio*



*Ratio of bank reserves to deposits.

Monetary Tools of SAMA

Monetary control in Saudi Arabia consists of controlling the spread between the growth of foreign assets and government deposits. Therefore, SAMA's monetary tools can be judged on the basis of how they affect this spread.

Actually, SAMA has available only one of the three traditional central-bank tools—reserve requirements. Open-market operations are excluded as a potential tool of policy, partly because the large cumulative government-budget surplus has made it unnecessary to issue government debt, and partly because the legal prohibition of interest payments has prevented the development of a domestic securities market. The discount rate is not a viable tool either, because SAMA's charter does not allow it to lend to commercial banks or to receive interest. That leaves reserve requirements as the primary monetary tool.[22]

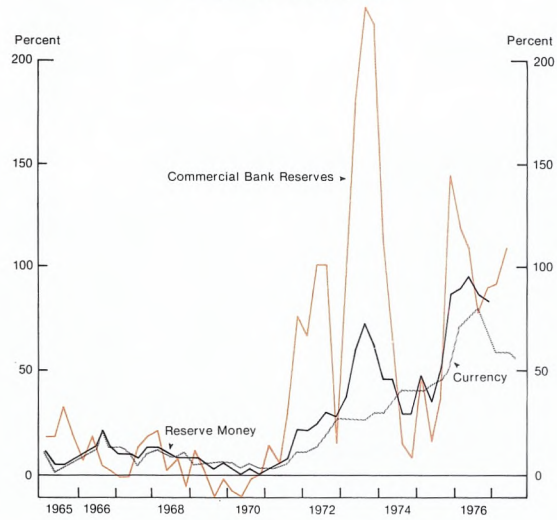
SAMA has the statutory authority to vary reserve requirements within a range of 10 to 17½ percent of deposits. It can exceed those limits 1) when it receives permission from the Ministry of Finance and National Economy, or 2) when commercial-bank deposits exceed 15 times the banks' net worth. In the twenty years since SAMA's creation, it has changed the statutory reserve requirement only three times.[23] SAMA's reluctance to pursue an active policy of monetary control via reserve requirements reflects the fact that most domestic money creation results from government spending and loan programs, rather than from lending and investment activities by commercial banks.[24] If most domestic liquidity is created outside the commercial banks, any SAMA action to restrain their activity would contribute to the relative decline of those institutions while only temporarily affecting the total amount of liquidity. In addition, if bank loans were an important source of private investment, then squeezing the banks would also reduce the production capacity of the economy.

On one occasion, however, SAMA apparently used reserve requirements to absorb an excess growth in reserve money. In 1972 and 1973, the worldwide business-cycle boom greatly increased oil revenues, and thus SAMA's foreign assets rose to what were then unprecedented heights (Chart 4). Government deposits at SAMA also rose proportionately in the first year of the expansion (1972), thereby keeping the growth in reserve money only moderately above its average growth rate of the preceding eight-year period. But in 1973, government spending increased in response to the higher level of revenue, and government-deposit growth declined relative to foreign assets. Reserve money, as a consequence, increased by 62 percent in 1973, versus 25 percent in 1972 and the 1-to-13 percent growth range of the preceding eight-year period (Chart 6).

Commercial banks participated in this domestic boom with a substantial increase in deposits. While SAMA normally sets reserve requirements within a legal range of 10 to 17½

Chart 6

Components of Reserve Money — Liabilities to the Public



percent, it can raise the requirement to 50 percent for any bank whose deposits exceed 15 times that bank's net worth. Previously, when deposit growth approached the 15-times-net-worth limit, SAMA under its statutory authority permitted banks to increase their capitalization, so that they could avoid the higher marginal-reserve requirements. It apparently did not follow this path in the 1972–73 period, however, and the ratio of reserves to deposits (r) thus went from an average of .16 in 1971 to .22 in 1972 and to more than 0.50 in the third quarter of 1973 (Chart 5). SAMA later permitted some banks to increase their capitalization, and the reserve ratio then declined to about 0.40.

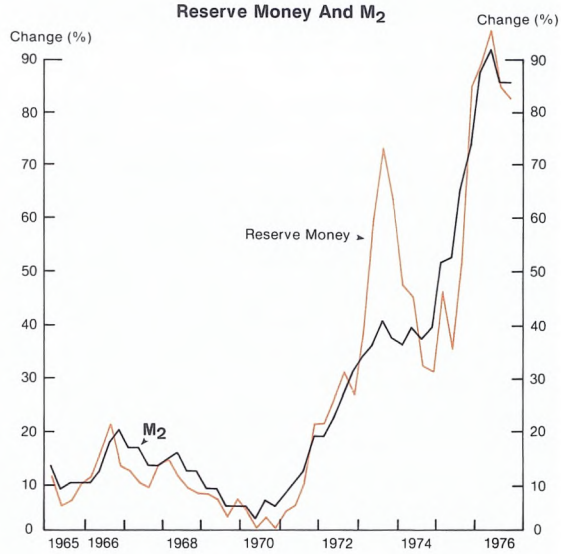
The *de facto* increase in reserve requirements increased the demand for reserves by 90 percent in 1972 and by more than 200 percent in 1973 (Chart 6). This absorbed much of the excess growth in reserve money generated by the increase in government spending, so that the currency increase was held to 15 percent in 1972 and 25 percent in 1973. The growth in M_1 and M_2 was also held below what would be implied by the expansion in reserve money (Chart 7).

This *de facto* rise in reserve requirements was clearly successful in restraining the potentially inflationary expansion in reserve money from being transmitted to the monetary aggregates. However, this action, once taken, is hard to repeat.[25] The theoretical maximum reserve requirement—100 percent—would destroy the banking system, and it would also greatly impede the financial development which is such an important ingredient of the economic-development process. Thus, this powerful monetary tool probably has already been used to the fullest extent practical.

The reluctance of the monetary authorities to repeat the 1973 action in the face of another rise in reserve money is demonstrated by what occurred in 1975–76. This was almost a repeat of the 1972–73 story, except that all the numbers were scaled up by a factor of ten due to a dramatic rise in the price of oil. The large increase in oil revenues which commenced in early 1974 led to an unprecedented rise in SAMA's foreign assets, and this led in 1974 and early 1975 to a proportional unprecedented rise in government deposits (Chart 4). But after mid-1975, government-deposit growth fell behind the growth of foreign assets, and reserve money accelerated once again. This time, while there was a small rise in *de jure* reserve requirements, there was no change in *de facto* reserve requirements and no exceptional increase in the demand for reserves by commercial banks. As a result, currency, M_1 and M_2 all increased in line with the accelerated growth in reserve money (Charts 6 and 7).

Chart 7

Reserve Money And M_2



From Reserve Money to Currency

While the discussion above has focused on the control of reserve money, our primary interest is the control of currency. Reserve money equals currency plus bank reserves, so that targeting the growth of currency means that SAMA should accommodate increases in the demand for bank reserves, but not increases in the demand for currency.[26]

Once control of reserve money has been achieved, there are few additional technical problems involved in controlling currency. All that is needed is information on the break-down of reserve money between currency and bank reserves. As reserves play a more important role in supporting financial deepening, they could be allowed to grow unhindered. A currency target could be achieved in the same way as a reserve-money target, i.e., by controlling the spread between foreign assets and government deposits. The growth in bank reserves, treated as a potential leakage, would probably permit a somewhat faster growth in reserve money than in currency. Data on bank reserves are available from commercial-bank reports made to SAMA, with a relatively short time lag. Thus currency data could be determined as the difference between reserve money and bank reserves.

V. Techniques of Control

In the preceding section, we showed that control of reserve money and currency required control of foreign assets, or of government deposits in the SAMA balance sheet. A number of possible control techniques are considered below.

Foreign Assets

Given the importance of oil revenues, the only way that foreign assets can be controlled is by inducing the private sector of the economy to exchange domestic assets for foreign assets or goods. Purchase of foreign goods is constrained *not* by government controls but by the capacity of the economy to absorb additional goods and services. This is the most important limit in the growth of real income, and thus is the main factor in targeting currency growth. The private Saudi purchase of foreign assets is independent of the absorptive capacity of the Saudi economy, but is constrained by the degree of foreign-exchange risk people are willing to take. SAMA could provide various incentives to encourage private Saudis to increase their foreign-asset holdings, and thus reduce proportionately SAMA's own holdings of foreign assets. Specifically, this could be done by denominating government foreign contracts in foreign currency, or by encouraging the development of financial institutions to invest private Saudi funds abroad.

Denominating foreign contracts in both foreign and local currencies. Present practice in Saudi Arabia differs from one ministry to another and from one contractor to another. Since the budget is defined in local currency, it is easier for the government to control its spending if foreign contracts also are defined in local currency. Without this provision, a change in the exchange rate could cause the government's budgeted spending to be in error. Problems could arise from local-currency denomination because payment in riyals would add to private liquidity as government deposits with SAMA are transferred to private ownership. At first blush the problem would seem to be minimal, occurring only if foreign contractors kept their receipts in riyals for an extended period of time. To the extent that most foreign contractors would convert into foreign assets of SAMA, parallel with a decline in government deposits, this would neutralize the effect on reserve money.[27]

But where an appreciation of the riyal is expected, the payment of foreign contractors in riyals could lead to a substantial increase in domestic liquidity as they maintained riyal balances and borrowed foreign exchange to cover their expenses. These considerations suggest the advantages of denominating foreign contracts in foreign currency, especially during periods of intense speculation about riyal appreciation, because this course would provide better control of the domestic money supply and hence of inflation. However, by denominating foreign contracts in foreign currency, any change in the exchange rate would create errors in the government's budget and spending plans. It is difficult to determine whether the advantage of improved

control over inflation would outweigh the disadvantages arising from denominating foreign contracts in foreign currencies.[28]

Encouraging foreign investment by Saudi nationals. Private capital outflows, as we have seen in recent years, represent an important way of reducing SAMA's foreign assets. However, the incentive to invest abroad is weakened in any period of exchange-rate uncertainty, such as the present. The government could take several actions to counter this uncertainty, such as absorbing part of the exchange risk involved or developing new institutions to channel funds abroad.

The government could absorb part of the foreign-exchange risk involved in foreign investment by guaranteeing all or part of the domestic-currency value of foreign assets. Such a guarantee could be potentially costly to the government, but perhaps no more so than other transfer payments that are designed to add to the wealth of the public. For example, the government provides a housing subsidy in the form of long-term, zero-interest-rate loans in which only 80 percent of the value need be repaid. A foreign-exchange subsidy would have the added advantage of not straining—as a housing subsidy does—the already heavy demand for real goods and services within Saudi Arabia. However, with a foreign-exchange subsidy, the goverment could be criticized for apparently encouraging investment abroad rather than at home—even though the major hindrance to domestic investment is the lack of ability to import additional real resources. In any event, the proposal for a foreign-exchange subsidy is probably premature at this stage.

Alternatively, the government could provide increased information regarding foreign-investment opportunities, and even support financial institutions which act as conduits for investing private funds abroad. Such a step, without at least partial coverage of foreign-exchange risks, would probably not stimulate increased savings in the form of foreign securities. But any success in transferring private domestic assets into foreign assets would reduce SAMA's foreign-asset holdings.

Increasing the incentive of the private sector to invest abroad could not be considered a "fine-tuning" technique of controlling reserve money, because this approach requires the voluntary cooperation of private persons in controlling the level of foreign assets on a continuing basis. Thus, while foreign-asset control is an important tool, it is also blunt—analogous to the use of reserve requirements to control the money supply in the U.S.

Government Deposits

The control of government deposits represents the only fine-tuning technique for controlling the currency issue of SAMA. The reason is quite simple: the government can unilaterally determine the level of these deposits. Thus, once the Council of Ministers decrees a given currency issue, the decision can be implemented directly via control of government deposits at SAMA. This policy tool is highly flexible, and can be fine-tuned in a way analogous to open-market operations in the U.S. The government can operate in either of two ways: directly, via control of government spending, or indirectly, via mobilization of domestic private assets.

Controlling government spending. One approach would be to develop a "monetary" budget parallel to the normal spending and loan budget. Budget makers would determine the target growth in currency, and would then look at the government spending budget to see if leakages into imports, foreign assets and domestic assets (other than currency) would lead to a growth in currency which is consistent with the target. In Section IV, we showed that these three leakages between government spending and the currency growth act as an automatic control on the growth of currency. Thus, given a currency target and knowledge of the leakages, one can target government spending to hit a currency target with some small margin of error. If for whatever reason the government-spending target is not realized, the resulting excess growth in currency could be calculated and the consequences for domestic inflation determined.

The necessary institutions for controlling currency growth are already in place. The Council of Ministers currently must approve the size of any SAMA currency issue. At present, if SAMA issues more currency than expected within a given time period, the Council will generally

authorize a further issue of currency as a matter of routine. In other words, any error is treated as a simple forecasting error, representing an over- or under-estimate of the growth of the economy. But if policy makers perceived that currency growth was not simply a *consequence* of domestic growth, but rather a major *cause* of domestic inflation, they could utilize this same procedural mechanism to make the currency target a matter of high policy.

Mobilizing private savings. A second approach would be to finance government spending by borrowing from the public so that there would be no need to draw down government deposits at SAMA. This is the type of "leakage" used by developed countries to finance government spending. Indeed, this is the very technique used to separate monetary policy (control of money) from fiscal policy (government budget).

In Saudi Arabia, however, there would be several problems with such an approach. First, it might seem strange if a government with a large budget surplus were to "borrow" money to meet its expenditures. The action could be justified on the basis that because government revenue comes from abroad, any government spending which is not directed at foreign purchases will be analogous to running a government deficit in the United States. This "deficit" should be financed by domestic savings if it is to avoid adding to inflation.

A second and more substantial problem would be the government's inability, for legal and religious reasons, to pay interest on its securities. The problem may not be insurmountable, for reasons discussed below. Even if such securities could be made acceptable to the public, they could increase the pressure on the government to raise its spending even further, because the statistical budget surplus would remain large. And with increased government spending, we would be faced again with the original dilemma.

This particular proposal thus is not technically viable, but it does point to an important potential avenue of monetary control, i.e., providing the private sector with a secure and risk-free asset. Such an asset would be in great demand in this financially conservative country. It would also tend to legitimize financial assets generally, in a land where the public suspicion of banks is still strong. All that is needed, as discussed below, is a technically feasible way of mobilizing private savings to achieve the desired monetary-policy goal.

Pass-Through Certificates[29]

A potentially useful method of controlling currency, combining elements of both foreign-asset control and government deposits, would involve the use of "pass-through certificates". These certificates would operate as follows:

1. SAMA would establish a special pass-through account, to which it would transfer a certain share of its foreign assets.

2. SAMA would stand ready to sell riyal-denominated pass-through certificates in an amount equal to the local currency value of the foreign assets in the special account. If these certificates were purchased by the government, they would be paid for by a reduction in government deposits at SAMA, with no initial effect on reserve money or currency. If the certificates were purchased by the public, they would be paid for by both currency and checks, which (via a reduction in bank reserves) would reduce the amount of reserve money and currency in the hands of the public.

3. These certificates would not pay interest directly, but would simply "pass-through" the income received by SAMA on the foreign assets in its special account. In addition, because the certificates are denominated in local currency, there would be no foreign-exchange risk to the purchaser.[30] These characteristics would make the pass-through certificates desirable to hold by the public.

4. Government purchases of these certificates would not immediately affect the level of reserve money, because the reduction in government deposits at SAMA would be matched by an equal and opposite increase in the number of pass-through certificates which SAMA would "warehouse" for the government. However, in the event that the government runs a budget deficit at some future time, the pass-through certificates would provide a method of financing other than through SAMA. The government could sell its pass-through certificates to the public in an amount equal to its deficit. This would be non-inflationary because the funds

which the government would put into the economy would be matched by funds withdrawn via public purchase of certificates from the government. This procedure can be contrasted with the current situation, where any government budget deficit would be financed by a simple reduction in government deposits at SAMA—financed, in effect, by a money-creation process which would represent a net increase in public liquidity in the form of reserve money. Thus, the current procedure potentially could be far more inflationary than the pass-through certificate proposal.

VI. Summary and Conclusions

Saudia Arabia represents an interesting test case of the role of monetary factors in inflation. It would seem on the surface to be the least likely country to show any such influence, because: 1) imports make up a very significant share of total goods and services available, and 2) government spending is the dominant source of changes in domestic aggregate demand.

The first proposition suggests that developments in the rest of the world, rather than domestic factors, largely determine the domestic inflation rate. The second proposition suggests that where domestic factors are involved, they should be due to fiscal rather than monetary policy.

This study has shown, nonetheless, that domestic monetary policy plays a significant role in determining the domestic inflation rate. The difference between the forces determining inflation in Saudi Arabia and in the world's major industrial countries is only one of degree and not of kind. For example, in Section III, we showed that identical equations can be used to explain the Saudi Arabia and U.S. inflation rates. These factors consist of 1) the expansion in the domestic money supply over the previous three-year period, and 2) the current rate of inflation in world prices, measured by export prices of the major industrial countries. The only difference between the Saudi and U.S. equations is the somewhat greater influence of world prices, and the somewhat lower influence of domestic monetary developments, upon the Saudi Arabian inflation rate. This, of course, is to be expected because Saudi Arabia is a much more open economy than the U.S. Nevertheless, Saudi Arabia can significantly influence its domestic inflation through control (if it chooses to exercise it) of its domestic money supply.

Three monetary aggregates represent potential candidates for targeting—M_0 (currency), M_1 (M_0 plus demand deposits) and M_2 (M_1 plus quasi-monetary deposits). Our results suggest that currency is the best of the three as a control vehicle. M_1 and M_2 growth are both strongly influenced by financial developments which are not *necessarily* associated with inflationary pressures. They may instead reflect the growth of financial intermediation and thus the financial deepening of the Saudi economy. The demand for currency, on the other hand, does not appear to be strongly associated with financial development, but rather is related to transactions needs, i.e., increases in aggregate demand.

To achieve stable domestic prices, policymakers should choose a target growth rate for currency which is roughly equal to the growth in the real demand for currency—that is, roughly equal to the growth in the nation's real income. Given her vast wealth of oil in the ground and foreign financial assets, Saudi Arabia's real-income growth is primarily a function of the "absorptive capacity" of the economy, which may be in the range of 20 to 30 percent per year. This would suggest that currency growth could be in the same range without adding significantly to inflation pressures.

As explained in Section IV, the major factor influencing the growth of currency is government spending. Spending will lead directly to increased currency issue unless there is a leakage of spending, either abroad into foreign purchases or domestically into purchases of financial assets. The relation between government spending and currency is unique to Saudi Arabia, because government revenue derives from oil sales abroad rather than from domestic taxes. Government spending, when it leads to foreign purchases, is analogous to other countries' use of domestic tax receipts to finance their spending. But government spending, when not matched by foreign purchases, is analogous to other coun-

tries' use of the budget-deficit mechanism to finance their spending.

Saudi Arabia, like many other developing countries, can finance only a relatively small amount of its government "deficit" from domestic savings because of the rudimentary nature of its financial system. In these circumstances, the central bank must monetize most of the "deficit"—which in Saudia Arabia's case means all government spending that is not diverted into foreign purchases (including purchases by the private sector). This situation occurs even though the government budget is in surplus by standard accounting rules.

The process described above can be explained in terms of the SAMA balance sheet. Government spending will be reflected in a decline in government deposits at SAMA which if matched by an increase in foreign purchases will lead to an equal decline of SAMA foreign assets. This will neutralize the effect on the currency issue. If not matched by an increase in foreign purchases, the deposit decline will lead to a rise in SAMA's other liabilities, either in the form of currency or bank reserves. If matched by an increase in bank reserves, the deposit decline will reflect the financing of government spending by the *de facto* mobilizing of private domestic financial assets. (Bank reserves at SAMA would rise because of a rise in bank deposits from the public.) Finally, if not matched by a decline in foreign assets or increase in bank reserves, the government-deposit decline would necessarily lead to a rise in SAMA's currency issue.

Until now, SAMA has relied upon changes in reserve requirements as its major monetary tool. With this weapon, it influences the currency issue indirectly. For example, a rise in reserve requirements causes commercial banks to increase their demand for reserves, and thus sterilizes the effects of any increase in government spending; i.e., a reduction in government deposits is matched by an increase in bank deposits at SAMA, leaving currency unchanged. But the reserve-requirement tool, if carried too far, could weaken the banking system and prevent if from playing its necessarily important role in the process of economic development. Indeed, *de facto* reserve requirements are now between 40 and 50 percent, so that it would be unwise to use this tool any further to control the currency issue.

In this situation, we make three specific proposals designed to improve Saudi Arabia's program of currency control, and hence of inflation control.

1. Set a target growth of currency equal to the real growth rate of the economy.
2. Control government spending so that it conforms with the targets established for currency growth.
3. Encourage private purchases of foreign assets in amounts which are consistent with the economy's domestic financial needs, through the development of such techniques as pass-through certificates. (See Section V.)

Reducing inflation is never an easy or costless task, in Saudi Arabia or any other country. However, the costs of inflation are very high. Policy makers at the highest level of government must determine for themselves whether the benefits of reduced inflation are worth the costs involved.

Appendix

Alternative Measures of Money and Inflation

The evidence presented in Section II suggested that currency was the best monetary aggregate for monetary control, because its demand was more stable than the other aggregates, M_1 and M_2. In Section III, we showed that the relationship between changes in currency and inflation was statistically significant. Below we present identical equations for M_1 and M_2.

M_1 and Inflation

$$\dot{(CPI)} = \underset{(3.7)}{-3.2} + \sum_{4} \underset{(6.7)}{0.45}\ \dot{(Pw)} + \sum_{12} \underset{(15.4)}{0.52}\ \dot{(M_1)}$$

$R^2 = .93$ DW = 1.63
SE = 3.27 DF = 35

M_2 and Inflation

$$\dot{(CPI)} = \underset{(5.7)}{-5.4} + \sum_{4} \underset{(7.8)}{0.51}\ \dot{(Pw)} + \sum_{12} \underset{(15.4)}{0.57}\ \dot{(M_2)}$$

$R^2 = .93$ DW = 1.63
SE = 3.25 DF = 35

In terms of overall statistical properties, the M_1 and M_2 equations are only slightly inferior to the currency equation. However, the key difference is in the value of the coefficient—.52 for M_1 and .57 for M_2, compared with the significantly higher .70 value for currency. The statistical reason for the difference is clear. M_1 and M_2 have grown more rapidly than currency, and thus the coefficient which describes how a 1-percent change in money affects inflation will be lower for M_1 and M_2 than for currency. The theoretical reason concerns the added financial demand for M_1 and M_2, which has been greater than the purely transactions demand for currency. Thus the same increase in M_1 and M_2 would have a smaller impact on inflation.

If we were confident that the coefficient value would remain constant in the future, we could use M_1 or M_2 as a monetary target. However, such confidence is unwarranted because of the actual and potential variance in the financial demand for M_1 and M_2, as described in Section II. Added variance would increase the variance in the coefficient relating money to inflation—and thus would increase uncertainty regarding targeted money growth and hence inflation. Even the currency coefficient is biased downward, not because of financial demand but because of a substantial but unmeasurable rise in transactions demand since 1974. In the case of currency, we can assume on theoretical grounds that the appropriate coefficient value will be 1.0—which we cannot do in the case of M_1 and M_2. Consequently, currency is the best monetary indicator.

FOOTNOTES

1. For example, if the price of oil were expected to appreciate by 5 percent per year, then a risk-free interest rate of 5 percent would just match the rate of return between oil in the ground and money in the bank. Changes in the inflation rate do not affect this calculation as long as the price of oil and the rate of interest are calculated in the same currency, such as the U.S. dollar.

2. Because oil revenues accrue only to the government, the only way to increase real income of the public is by increasing the prices of the things they sell, or by decreasing the prices of the things they buy. For the country as a whole, this requires a rise in the price of domestic (or non-traded) goods relative to the price of foreign (or traded) goods. There are only two ways this can happen: 1) exchange rate appreciation, which would transfer real purchasing power from the government to the public by reducing the domestic currency value of government oil revenue, and increasing the foreign purchasing power of privately held domestic currency; or 2) government spending with a fixed exchange rate, achieved either by (a) government transfer payments to individual Saudis with no increase in direct government purchases of goods and services, or (b) government spending via purchases of goods and services.

Both of these approaches would increase the nominal purchasing power of the private sector and, given an inelastic supply of domestic non-tradeables such as land, drive up its price. Because foreign (or tradeable) goods have an elastic supply, the price would not rise except as scarce domestic (i.e., Saudi Arabia) resources are added in the process of delivering imports to the public. Alternative 1 could be achieved without inflation. Alternative 2 would lead to some domestic inflation. The actual approach followed in Saudi Arabia is closest to 2b with some elements of 2a. Alternative number 1 apparently has been rejected because, while it would have increased total real income, most of the benefit would have gone to those with the greatest wealth. This was considered undesirable, as it would not contribute to reducing the inequality of income distribution.

3. The assumption of a unitary transactions demand for money is not unreasonable on the basis of long-term U.S. data which underlie most of the work on this subject. Post-World War II data, especially data for the decade since the mid-1960's, suggest a less than unitary transactions demand for money. See David Legler's **"The Demand for Money"** for a further discussion of this issue. John Scadding has shown, however, that the Post-WWII result may be specious. The period is one of higher average inflation—and, therefore, higher interest rates which tend to reduce the transactions demand for money. However, Scadding shows when you account for the increased implicit interest paid on money balances, you get a transactions demand coefficient which is close to one, even with post-WWII data.

4. Two recent regulatory changes in the U.S. have substantially affected the demand for money: (1) the November, 1975, regulation which permitted corporations to hold savings deposits, and (2) the November, 1978, regulation which permitted individuals to make automatic transfers between their demand and savings deposits. Both actions reduced the real demand for demand deposits and, therefore, the demand for the M_1 measure of money.

5. These criteria are not mutually exclusive. Instability in the public's demand for money can reduce the central bank's ability to control the money supply, depending on the definition chosen. For example, if the demand for deposits unexpectedly increases relative to the demand for currency, the money multiplier between central-bank assets and the total money stock will change in an unanticipated way. This would impair the central bank's ability to control the money-supply measure which includes deposits.

6. This measure of money could also reasonably be called M_3 because in the **International Financial Statistics** (IFS), the "other deposit" category or "quasi money" represents deposits of all financial institutions. However, non-bank financial institutions are relatively minor in scope in Saudi Arabia, or statistics are not available on their deposit balances. The latter includes such important financial institutions as money-changers, as well as banks located outside Saudi Arabia which accept deposits and make loans in riyals inside the country.

7. The legal system of Saudi Arabia is based on a strict interpretation of the Islamic Law, in which all interest payments are considered usury.

8. The legal prohibition of interest payments means that interest-rate data are not available. Real income data are available only on an annual basis from 1970 to 1976.

9. Banks have both responded to and helped develop this new financial wealth preference by opening new branches in many of the towns and villages where there were no financial institutions in the past. This has helped to break down the old suspicion of banks in the minds of many people, who find that deposits are more secure than domestic stores of gold and silver, and equally convenient when needed. There has, of course, been a substantial increase in the absolute quantity of traditional forms of real wealth, but because of the large increase in total wealth this is consistent with a more-than-proportionate increase in new financial forms of wealth. Judging by the stable ratio of currency to income, relatively little of this switch in asset holding is going into currency.

10. The discussion in this paragraph assumes that all of the increase in the observed reserve ratio is due to a change in de facto reserve requirements. Alternatively, it could represent a change in desired excess reserves of the banking system. The available data do not allow us to discriminate between these alternative hypotheses, because required reserves vary with each bank's capital-deposit ratio. However, circumstantial evidence supports the reserve requirement explanation. Typically, the demand for excess reserves increases in a period of increased risk and economic uncertainty. This was the U.S. experience during the Great Depression of the 1930's. But this hardly describes the economic experience of Saudi Arabia in the 1970's.

11. This relationship can be restated in the familiar Fisher equation of exchange:

$$MV = PT$$

Money (M) times velocity (V) equals the price level (P) times volume of transactions (T). Rearranging the terms and taking the rate of change would give the following transformed equation:

$$\dot{P} = \dot{M} + \dot{V} - \dot{T}$$

By assuming unity for T, the transactions demand, then V can be considered the financial demand for money. This is substantially the same equation as presented in the text.

12. Because of the unique characteristics of Saudi Arabian data, year-over-year changes rather than quarter-to-quarter rates of change are used in measuring all time series in this paper. Saudi Arabia follows the lunar calendar with 12 months, but its year is 11 days shorter than the Gregorian calendar year. There are procedures which allow for transformation of the Hijra-year statistics into Gregorian-year statistics. However, seasonal variations in Saudi Arabia are largely related to religious observances—such as Ramadan, which occurs in the same month each year in the Hijra calendar, but which may shift from summer to winter when corrected to the Gregorian calendar. The standard seasonal adjustment programs have difficulty dealing with such "floating" seasonals. Also, seasonal dummies cannot be used in the non-seasonally adjusted data because seasonal changes move from year to year when translated into the Gregorian calendar. This violates the assumption that the coefficient values are constant over the sample period. The only effective seasonal-adjustment technique in this case is year-over-year changes. This procedure allows for the gradual movement of the (statistically significant) seasonal religious holidays, and does less violence to the assumption of stable coefficient values over the sample period. While year-over-year percent changes have problems of their own, they represent less severe constraints than quarter-by-quarter percent changes.

13. Between December 1970 and December 1973, the riyal appreciated by 5 percent, i.e., from 4.50 riyals per dollar to 4.28 riyals per dollar. From December 1973 to December 1977, the riyal appreciated an additional 3.2 percent to 4.148 riyals per dollar. These changes are small relative to the 100-percent increase in the dollar price of internationally-traded goods between 1970 and 1977.

14. Michael W. Keran, "Stabilization Policies in a World Context," Federal Reserve Bank of San Francisco, **Economic Review,** Fall 1976.

15. In this equation M_1 is the U.S. money supply (currency plus demand deposits). DUM is a dummy variable to account for the period of price controls from 1971.4 to 1972.4.

16. One of the authors has developed a detailed analysis for Saudi Arabia. See Ahmed Abdullah Al Malik, **The Money Supply Process in Saudi Arabia,** Chapters 5 and 6 (1970), University of Indiana.

17. The evidence behind this proposition is discussed below. Chart 6 shows the strong association between RM and currency, while Chart 7 shows the link between RM and M_2.The major exception is 1973, which is explained below.

18. The concept of reserve money has a long history in monetary analysis. Irving Fischer (1896) called it simply "money"; James Tobin (1960) called it the "demand debt of the government"; Milton Friedman and Anna Schwartz (1963) called it "high-powered money"; Karl Brunner and Allan Meltzer (1968) called it the "monetary base." The IMF uses the term "reserve money" in its monthly statistical publication from which the data in this article are drawn.

19. Michael W. Keran, "Towards an Explanation of Simultaneous Inflation-Recession," Federal Reserve Bank of San Francisco, **Economic Review,** Spring 1975.

20. The Ministry of Petroleum and the Ministry of Finance jointly prepare estimates of the government's annual revenue, on the basis of data they receive from oil companies and the government's policy regarding quantity of oil production. Since the budget is always balanced, then *anticipated* revenue must equal *anticipated* expenditure. However, actual expenditures may fall below expectations, because of procurement delays caused by such factors as manpower bottlenecks. The end result is a surplus in the budget, which is added to the General Reserve and thus leads to a rise in government deposits. In recent years, the gap between anticipated and actual expenditures has narrowed, but it is still positive.

21. In contrast to the first two leakages, this would have less than a one-to-one impact on reserve money; that is, R1,000,000 of government spending leading to an equal increase in deposit savings would increase bank reserves by only about R500,000, because the marginal reserve requirement is about 50 percent. The remainder would eventually go into currency holdings, as the bank receiving the deposits loaned them out.

22. On several occasions, SAMA has used another monetary tool—direct loans to commercial banks through transfer of government deposits. In 1961, SAMA transferred SR 25 million of government deposits from its Banking Department to the commercial banks, and in 1964, it reversed this process by withdrawing SR 26 million of government deposits from the commercial banks. See **The Money Supply Process in Saudi Arabia** (Ch. 7) for further discussion of this monetary tool.

23. Reserve requirements were originally established in December 1957 at 15 percent of total deposits (demand plus time). The ratio was lowered to 10 percent in May 1962, but an additional liquidity ratio of 20 percent was then added, with the funds to be held in the form of vault cash, deposits with SAMA, or deposits with foreign banks. In November 1966, the reserve requirement on time deposits was lowered to 5 percent. Finally, in June 1976, the statutory reserve requirement was raised to 15 percent on both time and demand deposits.

24. In private correspondence and discussion, Dr. Omar Chapra (Economic Advisor to SAMA) makes this point explicitly. "The crux of the money supply problem is not that SAMA is unable to influence the quantity and quality of bank credit, but that changes in such credit have constituted such a small proportion of total credit."

25. In one sense the change in reserve requirements is constantly working—there is a permanently lower level of money and thus prices. However, from the point of

view of monetary control, each change in reserve requirements is a single influence on the rate of change of money and thus on the rate of inflation.

26. This would appear to be the reverse of the behavior of most other central banks, where currency is accommodated and bank reserves are controlled. However, emphasis should be put on the word apparent. There is no technical reason why any central bank could not target and control currency growth. But it is generally not desirable to do so, because: 1) the public in most countries treat currency and various classes of bank deposits as highly substitutable in terms of usefulness in meeting transactions needs, and 2) the financial motive for holding deposit balances is a relatively stable and predictable function of income and interest rates.

On both counts, it makes more sense to control an M_1 or M_2 measure in countries which show these characteristics. In Saudi Arabia, however, neither of these conditions holds and, thus, it makes more sense to control currency.

27. The only difference between riyal- and foreign-currency denomination of contracts from a monetary point of view would be the different impact on commercial banks. The banks, acting as intermediaries between foreign contractors and SAMA, in the latter case would earn something on the spread between buying and selling rates for riyals. With riyal-denominated contracts, there would be an increase in reserve money equal to the earnings on these transactions. This would not occur if contracts were denominated in foreign currencies.

28. Some contracts are currently denominated in both foreign and domestic currencies. The government and the contractors denominate a certain percentage in local currency to cover the contractor's estimate of his local expenditure, and the rest is denominated in foreign currency.

29. An earlier version of this proposal was suggested by John Scadding, 1978 Visiting Scholar at the Federal Reserve Bank of San Francisco.

30. The foreign-exchange risk would be borne by SAMA, which would have both a foreign-asset and a local-currency liability. However, SAMA would experience no greater risk than it currently does in having its assets in foreign exchange and its liabilities (largely government deposits) in local currency.

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