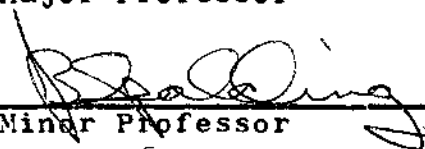


AN EXAMINATION OF THE FEASIBILITY OF
MEASURING NATIONAL INCOME FROM
MONETARY DATA

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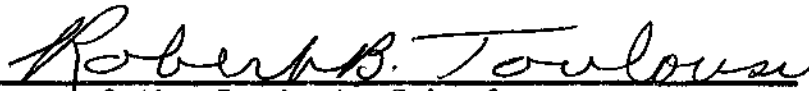
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Room

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The ubiquitous growth, in recent decades, of state control and intervention in economic affairs has necessitated more comprehensive systems of information on the performance of national economies. As nations were transformed into industrially advanced regions, their evolution required a concomitant reconstruction of economic doctrine that had previously stressed the principles of laissez-faire, a prime example being that of the United States. The complexity of social, political and economic forces underlying the operation of the technically advanced regions no longer permitted theorists to view economic systems as self-regulating mechanisms. "Mixed economies" with resultant state planning were needed to synchronize the activities of businessmen with the public well-being. In order to direct the activities of governments, systems of national accounts were developed more extensively to elucidate the functional relationships between major components of the economic systems.

None of the preceding, however, should be interpreted to suggest that the underdeveloped countries have not contributed to the need for the development of national accounting systems. State intervention in these areas will almost certainly be the

rule in order to provide for the cultural and economic prerequisites to growth, that is, to create climates conducive to progress by initiating programs to rid the populations of debilitating diseases, and to provide education for the eradication of illiteracy, as well as other cultural impediments to modernization. In addition, government participation will be required to provide the infrastructure--systems of transportation, communications, power facilities, etc.--which are initially unattractive investments for the businessman, but nevertheless critical ingredients to growth. It seems clear, then, that even for countries of primitive economic structure, to develop accounting systems which will reflect temporal changes in aggregate income is indispensable to planning.

Given the importance of statistics on aggregate output, the purpose of the paper is to explore, more fully, one particular aspect of economic accounting, measurement of national income. Since data problems often inhibit attempts to measure national income by conventional methods, particularly in less developed regions, the paper focuses attention on alternative techniques of measurement with major emphasis on procedures employing monetary data. In the first chapter, the uses, as well as the concept of national income, are discussed. The second chapter examines the theoretical feasibility of measuring income from the money stock and velocity. In the third chapter, national income estimates for forty-four

countries covering a period of five years are generated from data on the supply of money and velocity employing the techniques of multiple regression analysis. The final chapter, then, brings theoretical concepts and practical application into sharp relief thereby graphically illustrating the feasibility of estimating national income from monetary data.

AN EXAMINATION OF THE FEASIBILITY OF
MEASURING NATIONAL INCOME FROM
MONETARY DATA

THESIS

Presented to the Graduate Council of the
North Texas State University in Partial
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CHAPTER I

INTRODUCTION

The ubiquitous growth, in recent decades, of state control and intervention in economic affairs has necessitated more comprehensive systems of information on the performance of national economies. As nations were transformed into industrially advanced regions, their evolution required a concomitant reconstruction of economic doctrine that had previously stressed the principles of laissez-faire, a prime example being that of the United States. The complexity of social, political and economic forces underlying the operation of the technically advanced regions no longer permitted theorists to view economic systems as self-regulating mechanisms. "Mixed economies" with resultant state planning were needed to synchronize the activities of businessmen with the public well-being. In order to direct the activities of governments, systems of national accounts were developed more extensively to elucidate the functional relationships between major components of the economic systems.

None of the preceding, however, should be interpreted to suggest that the underdeveloped countries have not contributed to the need for the development of national accounting systems.

In the future it is unlikely that underdeveloped areas will develop by following the principles of laissez-faire where state direction is at a minimum. Rather

they will develop as mixed or fully regimented economies. They will be characterized either as "assisted" transitions to industrialization in the sense that state intervention is limited in extent or time or as "engineered" transitions where the state provides most of the driving force.¹

State intervention in these areas will almost certainly be the rule in order to provide for the cultural and economic prerequisites to growth, that is, to create climates conducive to progress by initiating programs to rid the populations of debilitating diseases, and to provide education for the eradication of illiteracy, as well as other cultural impediments to modernization. In addition, government participation will be required to provide the infrastructure--systems of transportation, communications, power facilities, etc.--which are initially unattractive investments for the businessman, but nevertheless critical ingredients to growth. It seems clear, then, that even for countries of primitive economic structure, to develop accounting systems which will reflect temporal changes in aggregate income is indispensable to planning.

Given the importance of statistics on aggregate output, the purpose of the following paper is to explore, more fully, one particular aspect of economic accounting, measurement of national income. Since data problems often inhibit attempts to measure national income by conventional methods, particularly

¹Daniel Creamer, "Uses of National Income Estimates in Under-developed Areas," Income and Wealth, Series III, edited by Milton Gilbert (Baltimore, 1953), p. 219.

in less developed regions, the paper focuses attention on alternative techniques of measurement with major emphasis on procedures employing monetary data. In the present chapter, the uses, as well as the concept of national income, are discussed. This will be useful later in evaluating the desirability of estimating national income by unconventional techniques. The second chapter examines the theoretical feasibility of measuring income from the money stock and velocity. In the final chapter, national income estimates for forty-four countries covering a period of five years are generated from data on the supply of money and velocity employing the techniques of multiple regression analysis. The final chapter, then, brings theoretical concepts and practical application into sharp relief thereby graphically illustrating the feasibility of estimating national income from monetary data.

The Uses of National Income Statistics

One of the motivating considerations in preparing national income estimates represents "the effort by economists and other students of human society to perceive the economy of the nation as a whole; to define the particular aspect that reflects in clear focus its essential functions and structure; to distinguish its major components--groups of economic activity; and to find a basis upon which both the parts and the whole can be measured to secure comparable magnitudes."²

²Ibid., p. 215.

The general purpose, then, of national income statistics suggests that they are equally relevant for developed and underdeveloped nations.

One particularly useful application of income projections is that they provide data on the past performance of the economy from which government policies can be evaluated, as well as providing information to forecast consequences of future action.³ In Puerto Rico, for example, it was believed, during the 1940's, that absentee ownership controlled a large portion of the economy. However, national accounts "indicated that the net external flow of property income was less than five percent of the net income produced in Puerto Rico during the decade of the 1940's."⁴ Clearly, then, national expenditure accounts provided information upon which more effective policy could be initiated.

In addition to the use of accounts by governments, business and labor organizations often find the statistics instrumental in decision making. "Businesses find in the accounts factual data about the distribution of national expenditure, i.e., which markets are expanding and which are contracting."⁵ Labor

³Harold C. Edey and Alan T. Peacock, National Income and Social Accounting (London, 1954), pp. 92-93.

⁴Creamer, op. cit., p. 216.

⁵Moshe Yanorsky, Social Accounting Systems (Chicago, 1965), p. 11.

unions, on the other hand, are often interested in the distribution of income shares relative to total production.⁶

Not only do the accounts provide data for analysis, but they also supply a means by which information can be catalogued and collected.⁷ In terms of cataloguing economic statistics, "an accounting approach provides a powerful means of handling the problems of consistency in definitions when we pass from general theoretical definitions to detailed descriptions of their empirical counterparts."⁸ As a means of collecting data for analysis, a national accounting system serves three functions:

- a. An accounting approach indicates what information must be collected and how it must be arranged in order to realize in numerical terms any particular theoretical system capable of such regulation.
- b. An accounting approach provides a basis for collecting economic information by means of sampling surveys of the different types of transactor. This basis offers the possibility of better coverage, increased accuracy, the estimation of sampling error and reduced cost.
- c. An accounting system approach enables the most efficient use to be made of the information available by bringing to light the many relationships connecting elements in a system of transactions, thus providing a basis for the adjustment of the observation.⁹

⁶Ibid., p. 11.

⁷Richard Stone, "Functions and Criteria of a System of Social Accounting," Income and Wealth, Series I, edited by Erik Lundberg (Baltimore, 1951), p. 4.

⁸Ibid., p. 7.

⁹Ibid., p. 7.

The purpose, then, of economic accounts is not only to provide data for interpretation, but also to provide a means by which diverse social phenomena can be organized for study.

Another important function derived from systems of accounts on national expenditure is their use in education.¹⁰ To the extent that accounts illuminate the interrelatedness between the various aggregates of the economy, they are particularly useful as pedagogical tools.

Probably one of the most extensive uses of statistics on national income has occurred on the international level. As the following quotation suggests, international development organizations, like national economies, have a requisite interest in income statistics.

When an international organization is established the question of financial contributions arises and it is usually decided that rich countries should contribute more than poor ones. If aid is to be allocated, some rules are needed as a basis and these rules are likely to take account of needs. The continuation of such grants must bear some relationship to performance and the contributions of different countries to a common effort must depend in some sense on ability to pay. In addition to these practical administrative needs there is the further fact that partners in a common enterprise will wish to be kept informed of one another's situation and progress, for in this way dangerous situations and costly mistakes may be avoided.¹¹

¹⁰Yanovsky, op. cit., p. 13.

¹¹Kurt Hansen and Richard Stone, "Inter-country Comparisons of the National Accounts and the Work of the National Accounts Research Unit of the Organization for European Economic Co-operation," Income and Wealth, Series III, edited by Milton Gilbert (Baltimore, 1953), p. 101.

Given the need for national expenditure statistics to development agencies, it is not surprising that such organizations often attempt international comparisons of income. However, there are several factors which suggest that economic accounts are not particularly well suited for this purpose, and therefore can provide, at most, only a summary notion of the disparities in the levels of income between regions.

First, in comparing international levels of income there is usually substantial variation in the quality of the data used in generating the measures, particularly between developed and underdeveloped nations.¹² To the extent that reasonably reliable estimates of aggregate output can be obtained in the industrially advanced regions while tenuous estimates usually characterize the poorer regions suggests that any attempt to measure differences in incomes will be distorted. The Office of Statistical Standards of the United States Bureau of the Budget has prepared a survey concerning the quality of data available in various regions.¹³ The results of the study are listed in Table I.

The average expected error in generating income statistics from nations classified as "very good" was listed as approximately

¹²Oskar Morgenstern, On the Accuracy of Economic Observations (Princeton, 1963), p. 277.

¹³Ibid., p. 279.

TABLE I
ACCURACY OF STATISTICS: VARIOUS REGIONS*

Type of Region	Very Good	Good	Fair	Weak
Number	17	9	18	20
Continent:				
Africa		1	2	6
North America	2	1	5	3
South America		2	4	2
Asia		2	5	8
Europe and Oceania	15	3	2	1

*Source: Oskar Morgenstern, On the Accuracy of Economic Observations (Princeton, 1963), p. 229.

ten percent.¹⁴ The expected error of income estimates in the other regions was not given. However, to the extent that seventeen countries were classified as "very good" while twenty nations were categorized as weak, suggests considerable variation in the quality of data between regions.

Second, efforts to secure comparable magnitudes via exchange rate conversion ignore the diverse institutional structures in which production occurs between nations. As Frankel states, "The creation of income takes place within a social

¹⁴Ibid., p. 279.

framework and a social situation. What income 'is' and how it is valued is determined by the social circumstances and surroundings in which the individual finds himself."¹⁵ The fact that different social values exist for different products between countries implies that "what is regarded as 'income' in one of them will be so different from, and incapable of comparison with, what is 'income' in another."¹⁶

The comparison [of goods and services] fails completely to indicate their relative importance in the value pattern of life and activity in the different societies of which they form a part. In other words, end products in the form of goods and services do not tell us the meaning which the society in question ascribes to their production, and to their use.¹⁷

Although the uses of national income statistics just mentioned are by no means exhaustive, they reflect some of the more prevalent ways in which data on aggregate output are frequently employed. The important point is that systems of national accounts are indispensable to nations, irrespective of their economic structure.

The Concept of National Income

Up to this point, the term national income, has been used without an expressed definition. Unfortunately, there are

¹⁵S. Herbert Frankel, "Concepts of Income and Welfare-- In Advanced and Under-developed Societies--With Special Reference to the Intercomparability of National Income Aggregates," Income and Wealth, Series III, edited by Milton Gilbert (Baltimore, 1953), p. 157.

¹⁶Ibid., p. 165.

¹⁷Ibid., pp. 165-166.

many conceptual differences between nations concerning the nature of national income. The concept varies from nation to nation reflecting diversity in methods of measurement to the extent that no uniform definition applicable for all countries exists. As Kuznets states:

National income may be defined as the net value of all economic goods produced by the nation. Each term in this definition--"net value," "economic goods," "produced," "nation"--is circumscribed by a wide area of reference accepted by common agreement and a substantial periphery subject to controversy and treated differently from time to time, country to country, and investigator to investigator.¹⁸

Rather than pursue a discussion concerning the diverse conceptual problems in defining national income between nations, which would be beyond the scope of this paper, national income, for present purposes, refers to the definition adopted by the United Nations. National income according to this criterion comprises the following components:

- a. Compensation of employees
- b. Income from unincorporated enterprises
- c. Income from property
- d. Saving of corporations
- e. Direct taxes on corporations
- f. General government income from property and entrepreneurship

¹⁸Simon Kuznets, National Income and Its Composition, 1919-1938 (New York, 1941), p. 3.

g. Less interest on the public debt

h. Less interest on consumers' debt¹⁹

As stated, each component will vary from region to region, but for the purposes of this paper they will be viewed in terms of a "wide area of reference accepted by common agreement."²⁰

¹⁹William I. Abraham, National Income and Economic Accounting (Englewood Cliffs, 1969), p. 104.

²⁰Kuznets, op. cit., p. 3.

CHAPTER II

THEORETICAL FEASIBILITY OF MEASURING NATIONAL INCOME FROM MONETARY DATA

The inaccessibility of reliable data is a recurrent theme in national income estimation, particularly for underdeveloped nations. Despite the efforts of the United Nations, the paucity of data has yielded traditional estimates which have been justifiably questioned. The problem of obtaining reliable statistics has led economists to devise techniques of estimation more suitable to the existing data.

One rather unorthodox approach was initiated by Olson in 1948. Using Colin Clark's concept of an international unit, Olson expressed national income in terms of a common unit of purchasing power. The international unit was defined to be "the amount of goods and services which one dollar would purchase in the United States over the average of the period 1935-1938."¹ Estimating equations for national income in 1937 were derived by regressing observed income (I) expressed in international units to various combinations of: total energy consumption excluding human (E), employed population (P), number

¹Ernest C. Olson, "Factors Affecting International Differences in Production," American Economic Review, XXXVIII (May, 1948), 507.

of livestock (L) and area of cultivated land (A). The estimating equations are listed in Table II.

TABLE II
ESTIMATING EQUATIONS FOR NATIONAL INCOME EXPRESSED
IN INTERNATIONAL UNITS, 1937*

Estimating Function	Regression Equation	Coefficient of Determination
$I = bP^kE^j$	$\begin{aligned} \text{Log } I &= \text{Log } b + k \text{ Log } P \\ &+ j \text{ Log } E \\ &= 1.476 + .294 \text{ Log } P \\ &+ .587 \text{ Log } E \end{aligned}$	0.896
$I = bP^kE^jA$	$\begin{aligned} \text{Log } I &= \text{Log } b + k \text{ Log } P \\ &+ j \text{ Log } E + \text{Log } A \\ &= 1.430 + .187 \text{ Log } P \\ &+ .577 \text{ Log } E + .129 \text{ Log } A \end{aligned}$	.902
$I = bP^kE^jL$	$\begin{aligned} \text{Log } I &= \text{Log } b + k \text{ Log } P \\ &+ j \text{ Log } E + \text{Log } L \\ &= .884 + .233 \text{ Log } P \\ &+ .504 \text{ Log } E + .277 \text{ Log } L \end{aligned}$	.938
$I = bP^kE^jL A$	$\begin{aligned} \text{Log } I &= \text{Log } b + k \text{ Log } P \\ &+ j \text{ Log } E + \text{Log } L \\ &+ \text{Log } A \\ &= .663 + .349 \text{ Log } P \\ &+ .478 \text{ Log } E + .409 \text{ Log } L \\ &- .176 \text{ Log } A \end{aligned}$	.944

*Source: Ernest C. Olson, "Factors Affecting International Differences in Production," American Economic Review, XXXVIII (May, 1948), 507, 510.

As shown from Table II, the most reliable estimating equation resulted when observed income was expressed as a function of all variables employed. This equation, as evidenced by the coefficient of determination, explained ninety-four percent of

the variation in the logarithms of observed income between nations. National income estimates derived from the equations are presented in Table III. Observed and calculated income in Table III refers to national income expressed in international units.

TABLE III
NATIONAL INCOME, 1937*
(Millions of International Units)

Country	Observed Income**	Calculated Income			
		f(P,E)	f(P,E,L)	f(P,E,A)	f(P,E,L,A)
United States	71,177	53,300	72,280	64,670	66,400
Canada	5,978	5,336	5,724	6,631	4,403
Argentina	7,369	3,292	5,670	4,030	5,582
United Kingdom	27,857	20,860	19,050	17,620	22,960
Norway	815	1,923	1,503	1,785	1,479
Sweden	2,316	2,726	2,265	2,777	2,022
Denmark & Iceland	1,326	1,329	1,311	1,381	1,235
Finland	770	1,216	1,027	1,247	916
France	15,036	12,370	14,440	13,520	14,660
Portugal	938	973	813	881	854
Netherlands	2,925	2,949	2,507	2,534	2,852
Belgium & Luxembourg	2,740	4,468	3,244	3,793	3,479
Germany & Austria	26,068	23,700	26,310	22,620	29,490
Switzerland	1,916	1,333	1,061	1,109	1,222
Baltic States	665	847	924	916	865
Poland	4,072	5,510	5,857	5,752	5,688
Czechoslovakia	2,463	4,695	4,170	4,612	4,037
Hungary	1,462	1,331	1,158	1,412	1,000
Balkan States	5,110	5,352	6,578	5,630	6,776
Australia	3,610	2,558	4,028	3,078	3,890
New Zealand	1,143	592	862	594	1,027
Japan	10,119	12,350	7,207	10,320	7,116

*Source: Olson, op. cit., p. 511.

**Observed Income refers to national income expressed in international units.

As evidenced by Table III, most of the regions used in deriving the estimating equations could be classified as developed. This probably reflects the fact that reliable estimates of the variables used in the estimating equations were not available for the underdeveloped regions. Olson's technique, then, suffers from the problem characteristic of many such diverse methods, a scarcity of data.

A prevalent trend in national income accounting, however, has focused attention on the use of monetary data as a potential predictor of income. There are several tenable reasons which can be advanced for the feasibility of using data on the stock of money and velocity to generate statistics on national expenditure.

The strategic advantage of monetary data for national income estimators is that they are likely to be statistically independent of the kinds of data generally used in constructing national income estimates. Any information they provide is a net addition to other information rather than simply a reformulation of such information.²

In a study recently conducted, Friedman estimates yearly net national product figures for the United States covering the period 1869 to 1879. In doing this Friedman suggests, "with but a negligible exception, not a single number used in the

²Milton Friedman, "Monetary Data and National Income Estimates," Economic Development and Cultural Change, IX (April, 1961), 268.

calculation of the net national product figures for the decade has been used in computing this estimate."³

In addition to an independent check on traditional measures, projections based on monetary data are likely to be subject to errors commensurate with conventional methods. This is true, in part, since fewer variables are employed when national income is measured from monetary data. Also, the simpler assumptions underlying monetary estimates of income are conducive to smaller errors of estimation.

The simpler, direct assumption relating the growing demand for money to the rise in money income provides satisfactory results while complying with the principle of "Occam's Razor"--the simpler the assumptions underlying the theory, the less chance of error.⁴

Friedman suggests in his study on net national product:

Of course, the monetary estimates too are subject to error and cannot be taken as entirely accurate. However, the fact that the monetary estimates indicate an error in the net national product figures in the direction of roughly the same order of magnitude as that suggested by independent evidence is some testimony to both the accuracy of the underlying monetary data and the validity of the relations used to convert the rate of change of the money stock into an estimate of the rate of change of income. The monetary estimates imply that the ratio of the 1869 to 1879 net national product estimates understates the

³Ibid., p. 281.

⁴J. W. Duggar, "An Examination of the Feasibility of Using Monetary Data for National Income Estimates," International Review of Income and Wealth, IV (December, 1968), 313.

"true" ratio by eighteen percent. The maximum estimated error cited by Kuznets is thirteen percent.⁵

Monetary data, in addition to the advantages already mentioned, have the added quality of becoming available early in a country's development. There are three factors which explain why this is true.

First, governments, during early periods of a nation's development, control the issuance of currency in order to direct coinage and to verify its weight and fineness.⁶ In addition, governments generally control the issue by other institutions of fiduciary currency.⁷ In directing the issuance of currency, governmental agencies often keep records of such activities and these provide vital statistics on the money supply.

Second, private banks, because their growth depends, in part, on the public's confidence in their financial stability, often publish records of their accounts even though there is no obligation to do so.⁸

A bank can attract deposits, or induce persons to hold notes, only insofar as it can instil potential depositors and noteholders with confidence . . . that the bank will meet its commitments promptly, and that a wide range of persons will be willing to accept its liabilities in discharge of debt.⁹

⁵Friedman, op. cit., p. 281.

⁶Ibid., p. 270.

⁷Ibid., p. 270.

⁸Ibid., p. 270.

⁹Ibid., p. 270.

Third, banks are usually subjected to governmental control sooner than other institutions and this frequently results in the reporting of balance sheet data.

This arises in large measure because the particular function that money performs enhances the chance that fraudulent issue will occur and because the pervasive character of the monetary nexus means that the failure of a bank to live up to its promises is peculiarly likely to have effects on third parties other than either the bank or its direct clientele.¹⁰

Monetary data, then, because of their advantages in terms of reliability and accessibility, are often useful estimators of national income. In addition, there are theoretical reasons which suggest the potential feasibility of generating income estimates from data on the stock of money and velocity.

Theoretical Justification

It is clear that money, by facilitating the process of exchange, is indispensable to a highly specialized economy in which an infinite number of transactions must be consummated. "The question at issue is, therefore, whether money exerts an important independent influence, not whether it is the only source of business fluctuations."¹¹

Irving Fisher, in The Purchasing Power of Money, expressed, using the famous equation of exchange, the most fundamental relationship between money and national income.

¹⁰Ibid., p. 270.

¹¹Milton Friedman, The Optimum Quantity of Money and Other Essays (Chicago, 1969), p. 266.

The equation of exchange relates to all purchases made by money in a certain community during a certain time. And in the grand total of all exchanges for a year, the total money paid is equal in value to the total value of the goods bought. The equation thus has a money side and a goods side.¹²

Expressed in mathematical form, the equation is given by the following:

$$MV = PQ$$

where,

M represents the total stock of money in a community,

V represents the transactions velocity of circulation, or the number of times money turns over in a given period of time,

P represents the price level, and

Q represents the total volume of goods bought.¹³

The left side of the equation represents the money side, and the right side, the goods side. The equation expresses, then, the relationship that the total amount of money spent (MV) must equal the dollar value of the total number of goods bought (PQ). It is, theoretically possible, therefore, to measure the amount of income spent, and thus received in an economy by multiplying the stock of money used in transactions by the intensiveness (velocity) with which the money is used.

¹²Irving Fisher, The Purchasing Power of Money (New York, 1931), pp. 16-17.

¹³Ibid., p. 26.

Excluding for the moment the necessity of being able to measure the money supply and its velocity, in order for changes in the money supply to reflect changes in nominal income, two assumptions must be made. These assumptions are:

(1) The demand for money (the reciprocal of velocity), that is the desires of consumers to hold money balances equal to a certain proportion of income, must be independent of changes in the money supply.

(2) The demand for money must be a stable function.¹⁴

If, as is often inferred from the equation of exchange, changes in the quantity of money invariably result in equal proportionate changes in nominal income, then clearly, velocity must be stable, and the variables which influence the demand for money must be independent of the variables which influence the supply of money. If this were not the case, that is if the quantity of money demanded were functionally related to changes in the stock of money, then any increase in the money supply could be offset by reductions in the transactions velocity of circulation to the extent that nominal national income would remain unchanged or would increase proportionately less than the increase in the stock of money used for transactions.

¹⁴Edgar Feige, The Demand for Liquid Assets: A Temporal Cross-Section Analysis (Englewood Cliffs, 1964), p. 11.

If an increase in the money supply by the monetary authorities induced people to hold a larger proportion of their income in money balances (increased the demand for money), then there would be a less than proportionate increase in nominal income. As a result of this interdependence between the stock of money and velocity, an increase in the money supply would be accompanied by a decline in velocity resulting in nominal income increasing by a less than proportionate amount.

The failure of contemporary economists to realize the form in which changes in the demand for money are expressed in statistical data appears to be due to an erroneous assumption that changes in the quantity of money reflect changes in the demand for money. This assumption carries with it the assumption that in practice the decisions which simultaneously increase the volume of bank assets and the money supply are made by customers of the bank. Scrutiny of the conditions under which loans and investments are acquired or relinquished by the banking system--that is, of the dominant forces influencing the total amount of bank loans and investments--shows that this assumption is incorrect. The quantity of money is dominated by factors on the supply side; that is, by the decisions of bank officials respecting their loans and investments, and by the conditions established by law and central bank operations under which bank officials make those decisions.¹⁵

It is similarly incorrect to assume that changes in the demand for money or the habits of the use of money reflect changes in the quantity of money. The demand for money is more

¹⁵Clark Warburton, "The Secular Trend in Monetary Velocity," Quarterly Journal of Economics, LXIII (February, 1949), 69.

appropriately determined by institutional factors such as the processes of production and marketing that exist in the economy. As Laidler suggests,

Once it has been argued that the demand for money stems from its use in the transactions-making process, it is but a short step to saying that the exact amount of money needed to carry out any given volume of transactions is determined by the nature of the production process as it exists in any particular economy. Once the matter is posed in this way, theorizing about the demand for money inevitably begins to concentrate on the nature of this production process. The institutional arrangements surrounding the settlement of accounts then comes in for study.¹⁶

First, the extensive use of credit affects the amount of money people need to hold in relation to their income.¹⁷ In an economy where there is widespread use of credit, consumers would apparently need less money on hand to finance a given volume of transactions. Similarly, among businesses, the practice of granting trade credit would induce businessmen to hold less money in order to maintain transactions.

Second, the complexity of communications networks in an economy influences the demand for money.¹⁸ In a nation where funds could be transmitted by telephone or telegraph, there would be less need to hold money balances than there would be in an economy where funds were primarily transferred by mail.

¹⁶David Laidler, The Demand for Money: Theories and Evidence (Scranton, 1969), pp. 45-46.

¹⁷Ibid., p. 46.

¹⁸Ibid., p. 46.

Third, the degree of independence between business firms is another factor affecting the demand for money.¹⁹ To the extent that there is a high degree of vertical integration, there would be less purchases made from the raw material to the final product stage. This, then, would imply that economies characterized by a high degree of vertical combinations would subsequently have less need to maintain money balances in order to finance a given volume of sales.

Fourth, the general level of economic development is a factor affecting the demand for money. "The monetization of the economy together with a decrease in payments in kind and agricultural dependence increases the relative need for money balances."²⁰ Similarly, as economic development proceeds, the number of wage earners would increase so that the length of time between pay periods would influence the demand for money.²¹ The longer the period of time between paydays, the larger would be the demand for money since relatively more money in relation to income would need to be held in order to maintain a given level of transactions.

Also, the rate of interest may be important in determining the demand for money.²² With high interest rates, the increased

¹⁹Ibid., p. 46.

²⁰Duggar, op. cit., p. 312.

²¹Warburton, op. cit., p. 88.

²²Ibid., p. 89.

opportunity cost of holding non-income earning money balances could lessen the desires of consumers and businessmen to maintain these balances.

Although this list is not exhaustive, it illustrates the complexity of factors that determine the demand for money and therefore its reciprocal, velocity.

The important thing about this view is that things like credit practices, communications and such, though they can certainly change over time, do not alter rapidly. Thus, if one thinks of them as being the principal determinants of the demand for money in an economy, he would argue that, over shorter time periods, there is little scope for variation in the amount of money demanded relative to the volume of transactions being undertaken. He would thus expect the velocity of circulation to be stable over such periods and, taking a longer view would expect changes in velocity to be rather slow and long-drawn-out, responding to slow institutional changes. Thus, as a good short run approximation, the transactions velocity of circulation comes to be treated as a constant.²³

Empirical evidence testifying to the stability of velocity in the United States is presented in Table IV. It should be noted from Table IV that, although velocity has not been constant over the years, it has remained relatively stable suggesting that slow, institutional changes were responsible for its variation, not simply changes in the money supply. Additional velocity estimates covering a period of five years for

²³Laidler, op. cit., p. 46.

TABLE IV
VELOCITY OF MONEY FOR THE UNITED STATES, 1869-1960*

Year	Velocity**	Year	Velocity**	Year	Velocity**
1869	4.57	1890	2.93	1911	2.09
1870	4.12	1891	2.94	1912	2.15
1871	3.91	1892	2.81	1913	2.17
1872	4.34	1893	2.87	1914	1.91
1873	4.35	1894	2.55	1915	1.90
1874	4.23	1895	2.71	1916	2.12
1875	3.99	1896	2.67	1917	2.18
1876	4.19	1897	2.81	1918	2.51
1877	4.48	1898	2.55	1919	2.28
1878	4.70	1899	2.48	1920	2.20
1879	4.67	1900	2.53	1921	1.90
1880	4.97	1901	2.47	1922	1.88
1881	4.10	1902	2.35	1923	2.04
1882	4.16	1903	2.34	1924	1.97
1883	3.76	1904	2.21	1925	1.88
1884	3.75	1905	2.18	1926	1.95
1885	3.43	1906	2.32	1927	1.87
1886	3.30	1907	2.30	1928	1.84
1887	3.22	1908	2.08	1929	1.95
1888	3.10	1909	2.23	1930	1.70
1889	3.06	1910	2.20	1931	1.47

TABLE IV--Continued

Year	Velocity**	Year	Velocity**	Year	Velocity**
1932	1.28	1942	1.84	1952	1.50
1933	1.38	1943	1.77	1953	1.51
1934	1.52	1944	1.61	1954	1.49
1935	1.52	1945	1.37	1955	1.58
1936	1.60	1946	1.16	1956	1.61
1937	1.67	1947	1.23	1957	1.63
1938	1.53	1948	1.31	1958	1.56
1939	1.52	1949	1.27	1959	1.63
1940	1.51	1950	1.43	1960	1.69
1941	1.61	1951	1.53	. . .	. . .

*Source: Milton Friedman and Anna Schmitz, A Monetary History of the United States, 1867-1960 (Princeton, 1963), p. 774.

**Velocity = Money income divided by money stock.

***Money = Currency plus demand deposits.

forty-four countries are listed in Appendix A. These figures also indicate a stable, but not constant, relationship over the period studied.

Theoretical Limitations

As an instrument in measuring national income, the equation of exchange, being an identity, cannot be impugned on theoretical grounds. However, because it is a tautology, there

are several reasons why the variables in the equation are difficult to bring into line with the theoretical concept.

First, there seems to be little general agreement among economists concerning an appropriate definition of money supply.

As H. G. Johnson suggests,

While the treatment of money as an asset distinguished from other assets by its superior liquidity is common ground among contemporary theorists, the transition from the conception of money as a medium of exchange to money as a store of value has raised new problems for debate among monetary theorists. These problems result from recognition of the substitutability between money (conventionally defined as a medium of exchange) and a wide range of alternative financial assets.²⁴

This distinction has resulted in formulations on the definition of money on "a priori" grounds generally stressing the medium of exchange and liquidity functions of money.²⁵

Contemporary writers who stress the medium of exchange function argue that the primary role of money is to facilitate transactions, and therefore should only include currency plus demand deposits. Although it is clear that money defined according to this criterion should include only items which can be used as a medium of exchange, there are several problems inherent with the approach.

²⁴H. G. Johnson, "Monetary Theory and Policy," American Economic Review, LII (June, 1962), 351.

²⁵Milton Friedman and Anna Schwartz, Monetary Statistics of the United States (New York, 1970), p. 104.

A minor difficulty with this approach is that the apparently simple criterion of whether an item directly serves as a medium of exchange turns out, on close examination, to be an uncertain guide to the classification of assets. At first glance, currency clearly seems to satisfy this criterion. Yet United States currency includes ten-thousand dollar notes. These can seldom be used directly as means of payment; they must first be converted into smaller denominations. Should they therefore be excluded from the total termed money? How about five-thousand dollar bills; one-thousand dollar bills? How do we decide which denominations are media of exchange, which near-money assets? A holder of a demand deposit may not be able to effect transactions with persons he does not know by direct transferral of his check; he may first have to "cash" a check at his bank or with someone who knows him. On the other hand, banks have often been willing to transfer time deposits from party to party, sometimes even by the close equivalent of checks. Many people in the United States, and even more in other countries, pay a part of their bills by converting currency into postal money orders or their equivalent. Are the money orders to be regarded as the medium of exchange, and currency not.²⁶

Although these examples may seem trivial, they are significant in that they expose the ambiguous nature of the medium of exchange concept. Yet, inclusion of items which may or may not serve as a medium of exchange is only part of the problem.²⁷

Cursory reflection suggests that the theoretical limitation of money to only currency and demand deposits leaves out a lot that influences people's willingness to spend or invest. Certainly, in many people's minds the sum of "money" they hold is made

²⁶Ibid., p. 106.

²⁷"Will the Real Money Supply Please Stand Up?," The Morgan Guaranty Survey (New York, 1971), p. 8.

up of a much wider range of financial assets than just currency and demand deposits. And thus if "money," as the theory suggests, is the critical factor in conditioning spending, there is good reason to consider the use for analytical purposes of a statistic that includes more than just currency and demand deposits.²⁸

The major question, then, is "whether the essential feature of money is its use as a means of payment."²⁹

In order for transactions to take place, there must clearly be something which serves as a medium of exchange. It is not clear, however, whether transactions "cash" must be held in "active" balances such as currency and demand deposits.³⁰ This suggests that, in order to determine the supply of money used as a medium of exchange, it is desirable to include balances, such as time deposits in commercial banks, which also serve as a "temporary abode of purchasing power."³¹

Both features are necessary to permit the act of purchase to be separated from the act of sale, but the "something" that is generally accepted in payment need not coincide with the "something" that serves as a temporary abode of purchasing power; the latter may include the former and more besides.³²

Some economists argue, then, that money supply defined as a medium of exchange must include those balances not held in the

²⁸Ibid., p. 8.

²⁹Friedman and Schwartz, op. cit., p. 106.

³⁰James Tobin, "The Interest-Elasticity of Transactions Demand for Cash," Review of Economics and Statistics, XXXVIII (August, 1956), 241.

³¹Friedman and Schwartz, op. cit., p. 106.

³²Ibid., pp. 106-107.

form of currency or demand deposits, but nevertheless are being maintained to facilitate transactions over extended periods.

A few numbers show the empirical importance of recognizing the asset as well as the medium of exchange role of whatever is regarded as money--at least for personal as opposed to business balances. Consider the definition of money currently favored by those who emphasize the medium of exchange role: currency plus demand deposits. In the United States in 1966, this total was equal to the value of four months' personal disposable income, about one month's in currency and three months' in demand deposits. Roughly two-thirds of the currency and two-fifths of the demand deposits were held by individuals and the rest by businesses. On the average, therefore, individuals held in currency about three weeks income, in demand deposits about five weeks', or a total amount equal to two months' disposable income. Is it plausible that anything like this large a sum was held for the narrow medium of exchange function of money alone--that is, for mechanical transactions needs?

When money has been an unattractive asset to hold, as in hyperinflations, the quantity held, expressed in terms of income or in real value, has sometimes fallen to less than one percent of its initial value. This quantity represents an estimate of the irreducible minimum necessary for transactions purposes. And even in much more moderate inflations, the quantity held has often fallen to one-half or one-third of its level when prices are stable. Applied to the United States, this experience would imply that, for individuals and businesses combined, roughly one to two days income is the hard core, as it were, of what might be called transactions balances proper, and one to two months' income is the level of balances that can be maintained for extended periods without serious transactions difficulties.³³

It is doubtful, then, that money should be viewed solely on the basis of a medium of exchange. Consequently, it is equally incorrect to define money strictly in terms of currency and demand deposits.

³³Ibid., pp. 107-108.

Of course, the medium of exchange function can be defined to include general acceptability in payment, as well as a temporary abode of purchasing power, but to do so would only broaden the definition of money to the extent that the term would be of little use in deciding on an empirical counterpart.³⁴

A similar attempt to escape from the difficulties of identification of money is to be found in the distinction sometimes drawn between "active money" and "idle money." But this distinction is at best misleading. No asset is in action as a medium of exchange except in the very moment of being transferred from one ownership to another, in settlement of some transaction, and no class of assets used in this way can logically be excluded from the class of active money. Between transactions all money is idle. Yet if activity is held to cover the state of being held in readiness against possible use in exchange, then all monetary assets are active all the time. It is not merely that we cannot easily earmark for statistical assessment the quantity that is active; there is no such quantity, except in the all embracing sense of all those goods or claims regarded by their owners as potentially useful for settling market commitments.³⁵

In other words, the question of which near-monies to include and which to exclude becomes the central issue. As Latane suggests, "there is no reason, in theory, to include, for instance, time deposits in money if savings bank deposits, building and loan shares, and short term government obligations, for example, are excluded."³⁶

³⁴Ibid., p. 107.

³⁵R. S. Sayers, "Monetary Thought and Monetary Policy in England," The Economic Journal, LXX (December, 1960), 712.

³⁶H. A. Latane, "Cash Balances and the Interest-Rate: A Pragmatic Approach," Review of Economics and Statistics, XLIII (November, 1954), 447.

The dilemma of which near-monies to include has led theorists to simply define money supply broadly in terms of liquidity. Yet, there seems to be no general consensus, owing, as suggested, to an absence of theoretical justification in categorizing assets, concerning a definition of liquidity. The generally accepted characteristics of liquidity, stability of value, and marketability, are too ambiguous in delineating between what items should or should not comprise money supply defined in this manner.³⁷ For example, assets which have a stable value, that is, can be sold at a predetermined fixed sum, would include Series E United States government bonds, cash values of life insurance policies, time deposits, and savings and loan shares.³⁸ On the other hand, marketable United States government securities, corporate bonds, and commercial paper would not be considered liquid by this criterion.³⁹ If marketability is the characteristic to be emphasized, then government securities and corporate bonds would be considered liquid, while time deposits and savings and loan shares would not.⁴⁰

Although the equation of exchange expresses an identity between money supply, velocity, and national income, it does

³⁷Friedman and Schwartz, op. cit., p. 129.

³⁸Ibid., p. 129.

³⁹Ibid., p. 129.

⁴⁰Ibid., pp. 129-130.

not provide any theoretical basis for defining the variable money supply. If, as the equation implies, money should include only items used in facilitating transactions, then, as has been shown, this apparently narrow theoretical construct becomes, on reflection, a much broader concept where, ultimately, inclusion of items rests on blurred gradations of liquidity. The problem, as indicated, is that there is simply no theory available with which to justify a definition of money.

Given the preceding argument, if monetary data are to be used in economic analysis, then, as suggested by Friedman, Angell and others, the appropriate definition of money supply should be selected on empirical grounds.⁴¹ If, for instance, national income estimation is the object of a study, then the definition of money which yields the most accurate estimates should be used.

To put the matter differently, the economic theory accepted at any time is in part a systematic summary of the empirical generalizations that have been arrived at by students of economic phenomena. This theory implicitly contains a specification of the empirical counterparts to the concepts in terms of which it is expressed--otherwise it would be pure mathematics. But the specification may be more or less precise, more or less definite. As the theory is refined and improved, it will generally lead to more precise specifications, and conversely, as we find one counterpart or the other to be more useful, it will enable us to refine the theory. It is our judgement that economic theory does not, as yet,

⁴¹James W. Angell, The Behavior of Money (New York, 1969), pp. 6-9.

give a very precise indication of the appropriate counterpart of the term "money." It simply suggests some of the general characteristics of assets that are likely to be relevant.

The problem is one that is common in scientific work. A preliminary decision--in this case, on the definition of money--must be made. Yet the decision can be made properly only on the basis of the research in which the preliminary decision is to be used. Strictly speaking, the "best" way to define money depends on the conclusions that we reach about how various monetary assets are related to one another and to other economic variables; yet we need to define "money" to proceed with our research. The solution, also common in scientific work, is successive approximations.⁴²

Therefore, since economic theory is impotent when dealing with the problem of defining money, the only solution remaining is empirical trial and error. This is the approach adopted in Chapter Three of this paper.

In addition to the conceptual problems of defining money, the use of monetary data in income estimation involves the difficulty of measuring money supply, however defined, and velocity.

The departures are explained by a single circumstance: the basic data are reported by the issuers of currency and by the banking institutions whose liabilities are so misleadingly termed "deposits," rather than by the holders of the currency and the deposits. As a consequence, it is often necessary to make the coverage of the data correspond to the geographic location or other characteristics of the issuers of currency or of the banking institutions or correspond to the character of their liabilities, rather than, as we should prefer, to the characteristics of the holders and of their monetary assets.⁴³

⁴²Friedman and Schwartz, op. cit., p. 91.

⁴³Ibid., p. 59.

Although money supply and velocity projections are estimates which are subject to error terms, reasonably reliable magnitudes can be obtained. Testimony of this, as provided earlier, is given by monetary estimates of national output with errors commensurate to traditional methods.

Income Studies

Despite the difficulties discussed, monetary data has been used in a number of studies to estimate national output for various countries during different time periods. Studies have indicated that money supply generally rises at a faster rate than nominal income so that it is possible to relate, statistically, changes in income with changes in the money stock.⁴⁴ For the United States, the simple correlations between the logarithms of the real stock of money per capita (currency outside banks, demand deposits, and time deposits in commercial banks) and net national product was 0.99 for the period from 1870 to 1954.⁴⁵ In addition, other studies have indicated simple correlations of roughly the same order of magnitude for various other countries.⁴⁶ Also, in the estimates

⁴⁴Milton Friedman, The Optimum Quantity of Money and Other Essays (Chicago, 1969), pp. 114-115.

⁴⁵Ibid., p. 113.

⁴⁶Duggar, op. cit., p. 312.

conducted in Chapter Three of this paper, using four definitions of money supply, the natural logarithms of money stock were correlated with the natural logarithms of nominal national income yielding coefficients as high as 0.99. It is not surprising then, that irrespective of theoretical difficulties, the strong empirical evidence relating changes in nominal income to changes in the stock of money has induced economists to employ monetary data in generating estimates of national output.

In a National Bureau of Economic Research study recently conducted, Friedman estimates net national product for the United States covering the period from 1834 to 1843.⁴⁷ In doing this, Friedman interpolates velocity estimates for this period backward in time from their observed movements during the period 1869 to 1879. After obtaining these velocity estimates, they are multiplied by estimates of money supply (currency outside banks plus all deposits in commercial banks) to yield projections of net national product. The results are tabulated in Table V.

Although Friedman's projections are probably reasonably accurate, their estimation requires a series of national product

⁴⁷Milton Friedman, "Monetary Data and National Income Estimates," Economic Development and Cultural Change, IX (April, 1961), 267-286.

TABLE V
NET NATIONAL PRODUCT IN CURRENT
PRICES, 1834-1843*
(Millions of Dollars)

Year	Estimated Velocity	Stock of Money	Estimated Net National Product
1834	7.12	113.0	805
1835	7.34	123.8	909
1836	7.40	160.9	1,191
1837	7.25	160.0	1,160
1838	7.06	158.3	1,118
1839	7.65	175.6	1,343
1840	7.38	159.3	1,176
1841	7.13	139.4	994
1842	6.80	144.0	979
1843	6.48	127.5	826

*Source: Milton Friedman, "Monetary Data and National Income Estimates," Economic Development and Cultural Change, IX (April, 1961), 285.

data from which to interpolate velocity estimates. Clearly, this method is not particularly useful when measuring output for less developed regions.

In a more comprehensive study, Doblin estimates national income for selected underdeveloped countries.⁴⁸ Using a rather

⁴⁸Ernest M. Doblin, "The Ratio of Income to Money Supply," Review of Economics and Statistics, XXXIII (August, 1951), 207.

unorthodox procedure, Doblin estimates velocity by regressing, between countries in 1938, the ratios of national income to currency (V) with the logarithms of per capita inanimate energy consumption (X). The resulting trend equation for estimating velocity was found to be:⁴⁹

$$V = 26.3973 - 6.3878X.$$

Using this equation, velocity figures were obtained which were multiplied by money supply (currency only) to yield national income estimates. The results are presented in Table VI. Even though the estimates for 1938 are highly consistent with traditional estimates, the procedure was tested in 1960, but failed to provide meaningful results.⁵⁰

One of the most promising techniques, instituted by Duggar in 1968, has achieved remarkable success in isolating the regularities between the stock of money and national income. In perhaps one of the most encompassing uses of monetary data, Duggar has simultaneously estimated national income for a large number of developed and underdeveloped countries. As with other studies, he assumes that the money stock generally rises at a rate faster than nominal income so that national income is defined by the following function:

$$NI = M^{B1}V^{B2}.$$

⁴⁹Ibid., p. 207.

⁵⁰Duggar, op. cit., p. 312.

TABLE VI
 REPORTED AND CALCULATED INCOMES FOR
 SELECTED COUNTRIES, 1938*
 (Billions of Local Currency Units)

Country	Reported Income	Calculated Income
China	25.715	27.067
Bulgaria	51.3	50.2
Mexico	5.323	4.804
Poland	17.7	14.9
Japan	22.5	19.17
Argentina	6.800	7.278
Greece	59.0	61.2
Italy	131	142
Austria	5.653	6.468
Netherlands	5.111	4.764
Czechoslovakia	59.2	65.7
France	355	496
Belgium	64.0	66.9
Bolivia	4.410	4.426
Brazil	38.0	396
Colombia	1.050	.925
Cuba	.488	.494
Ecuador	1.100	1.115
El Salvador	.240	.277
Egypt	.220	.280
Iceland	.120	.138
Philippines	.0013	.0027
Turkey	.0013	.0026
Uruguay	.436	.756
Venezuela	.0015	.0017
Yugoslavia	.068	.081

*Source: Doblin, op. cit., p. 208.

The function lends itself to a natural logarithmic transformation so that national income can be readily regressed to the stock of money and velocity yielding estimating equations of the form:

$$\text{Log NI} = \text{Log } + B_1 \text{LogM} + B_2 \text{LogV.}$$

Using data for a given year that is available in developed and less developed countries, the logarithms of United Nations national income projections are regressed to the logarithms of the stock of money and velocity so that a general trend in the variables is obtained. The trend equation is then used to generate income estimates for the particular year under study.

In selecting variables for the equations, Duggar adopts an empirical approach, that is, variables are selected on the basis of their predictive power rather than on theoretical grounds. As Duggar states,

The three national accounts variables tested were gross national product, gross domestic product, and national income. Each of the three national accounts aggregates were used as the dependent variable in the stepwise regression. In each case the independent variables were selected in the same order. When national income was used as the dependent variable the standard error of the regression equation was minimized and the simple correlation between money supply and national income was a maximum.⁵¹

In selecting the independent variables, five definitions of money supply were tested, as well as various velocity ratios. The most accurate results were achieved when money supply was defined as currency in circulation, and private and government demand deposits. The best definition of velocity occurred when defined as the monthly average of bank debits divided by the average stock of private and government demand deposits.

⁵¹Ibid., p. 317.

In addition to the monetary variables selected, others were tested in an attempt to increase the explanatory power of the regression equation. Specifically, exports, population, and energy consumption per capita were tested to determine their relationship with national income. The variable exports was the only non-monetary variable that exhibited a consistent high correlation with income. As a result, exports were often used in lieu of velocity for underdeveloped countries lacking data on bank debits. The simple correlation coefficients of all variables tested with national income are presented in Table VII.

TABLE VII
SIMPLE CORRELATION OF EIGHT VARIABLES
ON NATIONAL INCOME, 1960-1964*

Variable	1960	1961	1962	1963	1964
Currency	0.977	0.973	0.973	0.973	0.974
Demand Deposits	.998	.997	.996	1.000	.999
Government Deposits Time and Savings Deposits	.562	.593	.590	.596	.602
Monthly Bank Debits	.980	.991	.990	.982	.984
Exports	.810	.798	.791	.786	.770
Population	.995	.988	.991	.991	.992
Energy Consumption Per Capita	.374	.127	.123	.121	.361
	-0.052	-0.026	-0.018	-0.013	-0.059
Number of Countries in Sample	44	42	42	42	34

*Source: Duggar, op. cit., p. 317.

The estimating equations covering the period 1964 to 1968 are presented in Table VIII. In Table VIII, beta₂ (B₂) refers to the regression coefficient of exports and beta₁ (B₁) refers to the regression coefficient of money supply.

It should be noted from Table VIII, as given by the coefficients of determination, that the logarithms of money supply and exports consistently explained greater than ninety-five percent of the variation in the logarithms of national income. Also, the logarithms of exports generally increased the multiple coefficient of determination by approximately one percent so that the logarithms of money supply explained the greatest variation in the logarithms of national income. In addition, the coefficients of determination, as well as the beta coefficients exhibited little variation from year-to-year suggesting a stable functional relationship between the logarithms of money supply and exports in relation to the logarithms of national income.

Supplementing the estimating equations listed in Table VIII, for 1964 an estimating equation using money supply and velocity was developed. The equation with the standard errors and t-values in parentheses was defined by the following:

$$\text{LogY} = 1.747 + 0.920\text{LogM} + 0.055\text{Log } v^{52}$$

(0.037)	(0.031)
(24.861)	(1.737)

⁵²Jan Duggar, "International Comparisons of Income Levels: An Additional Measure," The Economic Journal, LXXIX (March, 1969), 113.

TABLE VIII
ESTIMATING EQUATIONS*

Year	Equation Constant	Coefficients (Standard Error)		Coefficient of Determination	Standard Error	F-Value
		B1	B2			
1960	1.586	0.877 (0.051) (17.317)	0.068 (0.040) (1.713)	0.952	0.348	208.25
1961	1.618	.895 (.050) (17.827)	.052 (.040) (1.299)	.953	.349	214.35
1962	1.585	.905 (.050) (18.155)	.047 (.039) (1.195)	.954	.343	219.70
1963	1.595	.903 (.048) (18.759)	.044 (.038) (1.163)	.959	.330	233.33
1964	1.835	0.877 (0.050) (17.460)	0.044 (0.038) (1.142)	0.955	0.338	203.42

*Source: Duggar, op. cit., p. 319.

The standard error of the regression was 0.332 while the coefficient of determination was 0.964. These values are commensurate with those obtained when exports were used in lieu of velocity.

In order to illustrate the accuracy of the estimating equations, projections based on money supply and velocity for 1964 are presented in Table IX. The countries listed were

TABLE IX
REPORTED AND ESTIMATED NATIONAL INCOME FOR COUNTRIES
USED IN DERIVING THE 1964 ESTIMATING EQUATION*
(Millions of Local Currency Units)

Country	Reported Income	Estimated Income
Australia	15,739	13,714
Austria	167,700	159,750
Belgium-Luxembourg	631,919	589,746
Canada	35,001	32,969
Ceylon	6,589	5,930
Taiwan	85,265	69,555
Denmark	48,588	46,644
Finland	18,798	17,371
Greece	123,700	106,144
Iceland	13,504	12,188
India	200,000	148,000
Ireland	752	714
Israel	7,074	6,033
Japan	20,047,000	17,439,000
Korea	529,480	304,910
Mexico	203,200	195,072
Netherlands	49,630	48,389
New Zealand	1,511	1,458
Philippines	16,019	13,142
South Africa	6,249	5,759
Switzerland	46,600	44,270
Thailand	58,800	48,800
United Kingdom	26,452	25,642
United States	517,900	487,400

*Source: J. W. Duggar, "International Comparisons of Income Levels: An Additional Measure," The Economic Journal, LXXIX (March, 1969), p. 114.

those used in deriving income estimates. In addition to these projections, income estimates for countries not used in the sample are listed in Table X. It should be noted that, prior

TABLE X

NATIONAL INCOME ESTIMATES FOR SELECTED
UNDERDEVELOPED COUNTRIES, 1964*
(Millions of Local Currency Units)

Country	Estimated Income	Country	Estimated Income
Cameroon	153,982.9	Mali	82,908.4
Central African Republic	30,649.8	Mauritania	19,879.5
Chad	42,915.6	Niger	35,636.1
Congo-		Nigeria	539.7
Brazzaville	47,491.6	Senegal	197,957.1
Dahomey	34,911.6	Somalia	847.6
Ethiopia	1,550.4	Sudan	288.9
Gabon	49,076.1	Uganda	115.3
Ghana	1,217.5	United Arab Republic	2,309.5

*Source: J. S. Duggar, "International Comparisons of Income Levels: An Additional Measure," The Economic Journal, LXXIX (March, 1969), p. 115.

to Duggar's study, the countries presented in Table X did not have income estimates since traditional measures could not be used due to a lack of available data.

Although theoretical difficulties concerning the appropriate definition of money supply have hindered attempts by economists to project national income from monetary data, reasonably reliable estimates have been made in the past. This owes largely to the strong empirical evidence relating changes in the stock of money to changes in nominal income. In the

following chapter, a series of stepwise multiple regressions have been developed which isolate, to a large degree, the movements of national income in relation to money supply.

CHAPTER III

NATIONAL INCOME ESTIMATION

As mentioned earlier, underdeveloped regions typically are characterized by an absence of statistical data on aggregate output. Yet, in order to distribute international aid, evaluate the effectiveness of development programs, as well as other reasons, measures of aggregate income are needed now. This has induced economists, appropriately enough, to devise techniques that correspond to the data in less developed regions rather than attempt procedures which would more conveniently fit the statistically abundant developed nations. The desirability therefore, of devising such a technique suggests that any method potentially useful warrants considerable attention. It is the purpose of this chapter to project national income by refining the basic procedure initiated by Duggar.

Methodology

Although the original technique proposed by Duggar explained, on the average, ninety-five percent of the variation in the logarithms of national income, the method used in this chapter explained, on the average, ninety-eight percent, and

in some cases, ninety-nine percent of the variation in the logarithms of national income between nations. Rather than simply aggregate developed and less developed regions, as does Duggar, to establish estimating equations, three major classes of equations were developed. The first class consisted of forty stepwise multiple regressions, employing four definitions of money supply in conjunction with transactions velocity and exports, from developed countries only, covering the period from 1964 to 1968. The second class, covering the same period, employed the same variables and number of regressions, but included data from less developed countries only. For purposes of comparison, a third class, employing the methodology of the two previous classes, was developed which simultaneously included data from developed, as well as underdeveloped regions.

The regression equations, all of which were expressed in natural logarithms, yielded over 3,500 estimates of national income. The best estimating equations were selected on their proximity to the corresponding dependent variable, United Nations national income projections. Therefore, with some modification, the methodology was analagous to the procedure employed by Duggar, and similarly, estimates were selected on an empirical, rather than theoretical basis.

Variables Employed

The four definitions of money used were as follows:

M_1 = Currency outside banks plus personal and government demand deposits.

M_2 = Currency outside banks, personal and government demand deposits plus domestic credit outstanding against the private sector.

M_3 = Currency outside banks, personal and government demand deposits plus personal savings deposits.

M_4 = Currency outside banks, personal and government demand deposits, domestic credit outstanding against the private sector plus personal savings deposits.

Transactions velocity was the same as defined by Duggar, the monthly average of bank debits divided by the average stock of private and government demand deposits. Exports were gross figures estimated as freight on board in local currency units.

As can be noted, the variables employed followed as closely as possible those employed by Duggar. The purpose was to determine if, by sectoring the nations as developed and underdeveloped, better estimating equations could be derived. Had different variables been employed, the studies would not have been strictly comparable. In addition, since Duggar previously established a low relationship between national income and other non-monetary variables, such as population and energy consumption per capita, no effort was made to include these in the estimating equations.

As indicated earlier, all variables were transformed into natural logarithms to comply with the estimating equations of the form:

$$\text{LogNI} = \text{Log}\alpha + B_1\text{LogM} + B_2\text{LogV}.$$

Therefore, as in Duggar's study, United Nations national income projections were chosen as the dependent variable which was regressed to the independent variables, money supply and velocity, and money supply and exports. A detailed description of the variables used is available in appendices A and B.

National Income Estimates: Developed Countries

In the first class of regressions, the logarithms of national income were regressed to the logarithms of the independent variables just described. Before discussing the estimating equations and the corresponding income projections, it is interesting to weigh the accuracy of the estimates on theoretical grounds. In other words, as suggested earlier through reasoning that involved the equation of exchange, changes in the money supply can be expected to mirror changes in nominal income if there is a close correlation between money supply and national income, and if velocity is a stable magnitude.

The simple correlation coefficients for developed countries only between the logarithms of money supply, velocity and exports in relation to the logarithms of national income are presented in Table XI. It should be noted from Table XI that all definitions of money supply exhibited a remarkably high

correlation with the logarithms of national income. Each definition consistently displayed a coefficient in excess of 0.99 over the period studied. This suggests, then, for developed countries, the definition of money supply is not as critical as some theorists have argued. The best definition, in terms of the highest correlation coefficient, occurred when defined as currency outside banks, personal and government demand deposits plus personal savings deposits (M_3).

TABLE XI

SIMPLE CORRELATION COEFFICIENTS BETWEEN THE LOGARITHMS OF NATIONAL INCOME IN RELATION TO THE LOGARITHMS OF MONEY SUPPLY, VELOCITY AND EXPORTS, DEVELOPED COUNTRIES, 1964-1968

Independent Variable	1964	1965	1966	1967	1968
M_1	0.9913	0.9917	0.9916	0.9918	0.9921
M_2	.9900	.9906	.9903	.9910	.9907
M_3	.9969	.9972	.9973	.9975	.9974
M_4	.9936	.9940	.9938	.9944	.9942
V	.0388	- .0222	- .0216	- .0905	- .0779
E	0.9736	0.9732	0.9740	0.9737	0.9728

Appendix A presents velocity estimates for the developed countries studied, and it should be noted that velocity displayed little variation during the period from 1964 to 1968. Combined with the stability of velocity, the high correlations

of the logarithms of money supply with the logarithms of national income suggest, theoretically, potential accuracy from the estimating equations.

The estimating equations for developed countries are presented in Table XII. As shown by the coefficients of determination, the equations explained from ninety-seven percent to greater than ninety-nine percent of the variation in the logarithms of national income between nations. The most accurate equations were obtained when the logarithms of velocity and exports were combined with the logarithms of money supply previously defined as M_3 .

Although the regression coefficients in Table XII indicate that money supply appears to explain the greatest amount of variation in national income, the exact amount explained by the stock of money or the other independent variables cannot be determined precisely. This is largely due to the fact that there is some degree of interrelatedness between the independent variables. Testimony of this, as provided in Table XIII, is evidenced by the high correlation coefficients between the independent variables. Nevertheless, several factors exist which suggest that money supply is, by far, the most important variable in explaining the variations in national income between nations.

First, in the stepwise regressions, the logarithms of money supply entered into the equation first, and explained

TABLE XII
ESTIMATING EQUATIONS: DEVELOPED COUNTRIES

Year	Equation Constant	Regression Coefficients (Standard Error) (t-Value)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1964	1.2874	0.9930M ₁ (0.0340) (29.2058)	0.0647V (0.0948) (.6824)	0.3365	0.9843	377.2705	0.000
	1.3110	.8559M ₁ (.1720) (4.9761)	.1387E (.2049) (.6769)	.3365	.9804	301.1226	.000
	.5620	.9910M ₂ (.0375) (26.4266)	.0567V (.1069) (.5304)	.3608	.9800	295.4009	.000
	.6855	.7898M ₂ (.1638) (4.8217)	.2059E (.1991) (1.0341)	.3608	.9790	280.4858	.000
	.5652	.9965M ₃ (.0230) (43.3260)	.0165V (.0638) (.2586)	.2161	.9929	837.0798	.000
	.6160	.8559M ₃ (.0820) (10.4378)	.1457E (.0970) (1.5020)	.1952	.9942	1027.0740	.000

TABLE XII--Continued

Year	Equation Constant	Regression Coefficients (Standard Error) (t-Value)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B1	B2				
1964	.1726	.9933M ₄ (.0321) (30.9439)	.0276V (.0907) (.3042)	.3069	.9856	412.5574	.000
	.3231	.8053M ₄ (.1177) (6.8419)	.1946E (.1416) (1.3742)	.2847	.9876	480.2280	.000
	1.3383	.9966M ₁ (.0336) (29.6607)	.0601V (.0930) (.6462)	.3203	.9844	379.1470	.000
1965	1.3861	.8868M ₁ (.1721) (5.1528)	.1073E (.2038) (.5264)	.3558	.9807	306.2263	.000
	.5772	.9937M ₂ (.0375) (26.4986)	.0458V (.1052) (.4353)	.3627	.9800	294.6145	.000
	.6995	.8149M ₂ (.1628) (5.0055)	.1805E (.1953) (.9242)	.3663	.9796	288.7734	.000
	.6085	.9975M ₃ (.0220) (45.3409)	.0108V (.0603) (.1791)	.2085	.9934	901.6113	.000

TABLE XII--Continued

Year	Equation Constant	Regression Coefficients (Standard Error)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1965	.6547	.8651M ₃ (.0776) (11.1481)	.1365E (.0909) (1.5016)	.1868	.9947	1124.4580	.000
	.1961	.9947M ₄ (.0316) (31.4778)	.0181V (.0880) (.2056)	.3038	.9859	422.0178	.000
	.3377	.8184M ₄ (.1152) (7.1041)	.1814E (.1368) (1.3260)	.2797	.9881	498.5938	.000
1966	1.3490	.9970M ₁ (.0330) (30.2121)	.0636V (.0874) (.7276)	.3165	.9849	391.1230	.000
	1.4237	.9147M ₁ (.1835) (4.9847)	.0785E (.2170) (.3617)	.3606	.9803	300.1973	.000
	.5746	.9937M ₂ (.0377) (26.3580)	.0489V (.1011) (.4836)	.3664	.9797	290.5835	.000
	.7056	.8201M ₂ (.1726) (4.7514)	.745E (.2069) (.8434)	.3757	.9787	276.2004	.000

TABLE XII--Continued

Year	Equation Constant	Regression Coefficients (Standard Error)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1966	.6195	.9977M ₃ (.0215) (46.4046)	.0138V (.0564) (.2446)	.2049	.9937	940.1711	.000
	.6666	.8802M ₃ (.0816) (10.7867)	.1207E (.0957) (1.2612)	.1911	.9945	1081.5269	.000
	.1997	.9946M ₄ (.0319) (31.1786)	.0211V (.0849) (.2485)	.3080	.9857	413.2615	.000
	.3427	.8248M ₄ (.1225) (6.7330)	.1742E (.1456) (1.1964)	.2898	.9873	467.6980	.000
1967	1.4016	.9993M ₁ (.0341) (29.3049)	.0529V (.0913) (.5794)	.3316	.9836	360.8059	.000
	1.4599	.9111M ₁ (.1766) (5.1591)	.0823E (.2135) (.3854)	.3602	.9806	305.0679	.000
	.5580	.9963M ₂ (.0371) (26.8544)	.0400V (.0994) (.4024)	.3615	.9805	302.8201	.000
	.6770	.8425M ₂ (.1676) (5.0268)	.1522E (.2023) (.7523)	.3662	.9800	294.8958	.000

TABLE XII--Continued

Year	Equation Constant	Regression Coefficients (Standard Error) (t-Value)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B1	B2				
1967	.6741	.9976M3 (.0208) (47.9615)	.0024V (.0554) (.0433)	.2023	.9939	977.8784	.000
	.6942	.8789M3 (.0755) (11.6410)	.1223E (.0906) (1.3498)	.1831	.9950	1194.4795	.000
	.2077	.9954M4 (.0307) (32.4234)	.0107V (.0818) (.1308)	.2987	.9867	445.7754	.000
	.3235	.8379M4 (.1161) (7.2170)	.1614E (.1396) (1.1561)	.2785	.9884	513.6350	.000
1968	1.3792	.9981M1 (.0340) (29.3558)	.0485V (.0902) (.5376)	.3311	.9838	364.8562	.000
	1.4446	.9430M1 (.1760) (5.3579)	.0500E (.2114) (.2365)	.3571	.9811	312.9253	.000
	.5563	.9943M2 (.0384) (25.8932)	.0329V (.1023) (.3216)	.3761	.9791	281.6348	.000
	.6486	.8649M2 (.1755) (4.9282)	.1288E (.2114) (.6092)	.3791	.9787	277.2021	.000

TABLE XII--Continued

Year	Equation Constant	Regression Coefficients (Standard Error)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1968	.6496	.9975M ³ (.0212) (47.0518)	.0019V (.0560) (.0339)	.2066	.9937	945.4399	.000
	.6633	.9023M ³ (.0812) (11.1120)	.0980E (.0972) (1.0082)	.1949	.9944	1062.0906	.000
	.1915	.9948M ⁴ (.0312) (31.8846)	.0071V (.0827) (.0858)	.3051	.9862	430.5354	.000
	0.2810	0.8634M ⁴ (0.1234) (6.9967)	0.1347E (0.1481) (.9095)	0.2915	0.9874	472.1375	0.000

from ninety-seven percent to ninety-nine percent of the variation in the logarithms of national income. In other words, when the logarithms of exports or velocity were used in the equations, little additional explained variation in the logarithms of national income resulted. In fact, on several occasions, exports and velocity reduced the variation in national income explained by the stock of money.

Second, the high regression coefficients attached to money supply indicate a strong relationship between money supply and national income. Conversely, the low regression coefficients attached to exports and velocity suggest a much weaker relationship with national income.

TABLE XIII

SIMPLE CORRELATIONS BETWEEN MONEY SUPPLY IN RELATION
TO EXPORTS AND VELOCITY, DEVELOPED
COUNTRIES, 1964-1968

	1964	1965	1966	1967	1968
M ₁ to V	-0.0261	-0.0826	-0.0855	-0.1436	-0.1266
M ₁ to E	.9753	.9763	.9789	.9782	.9784
M ₂ to V	- .0181	- .0684	- .0710	- .1311	- .1115
M ₂ to E	.9719	.9727	.9747	.9749	.9757
M ₃ to V	.0223	- .0331	- .0355	- .0932	- .0800
M ₃ to E	.9673	.9671	.9694	.9686	.9694
M ₄ to V	.0112	- .0405	- .0429	- .1018	- .0855
M ₄ to E	0.6973	0.9674	0.9696	0.9695	0.9706

Since money supply is the most important variable of those employed in explaining variations in national income, then the accuracy of the estimating equations will depend, largely, on the definition of money supply. As suggested earlier, Duggar employed the definition of money supply designated previously as M_1 . However, using this definition, the estimating equations, as indicated earlier, explained only ninety-six percent of the variations in the logarithms of national income between nations. This study determined that, for developed countries, the best definition of money supply was that defined earlier as M_3 . As noted, this yielded estimating equations which explained in excess of ninety-nine percent of the variations in national income. This result suggests, therefore, that a uniform definition of money supply cannot be applied to developed, as well as less developed regions without sacrificing the reliability of the income estimates.

In order to illustrate the accuracy of the estimating equations, Table XIV presents national income projections for the developed countries used in deriving the estimates for 1968. Appendix C contains national income estimates covering the period 1964 to 1968. The estimating equation used for the income projections in Table XIV was:

$$\text{LogNI} = 0.5652 + 0.9965\text{LogM}_3 + 0.0165\text{LogV}.$$

For purposes of comparison, United Nations national income projections are also presented in Table XIV.

TABLE XIV

ESTIMATED AND UNITED NATIONS NATIONAL INCOME PROJECTIONS
FOR THE DEVELOPED COUNTRIES USED IN DERIVING
THE ESTIMATING EQUATIONS, 1968
(Billions of Local Currency Units)

Country	United Nations Estimate (1)	Predicted Income (2)	(1) - (2)
Australia	21.391	21.685	- 0.294
Austria	218.899	227.466	- 8.566
Canada	50.458	41.037	9.420
Denmark	71.579	71.470	.109
Finland	26.424	25.965	.458
Italy	37884	33359	4524
Japan	40817	42232	-1415
Netherlands	73.999	48.092	25.907
Norway	49.319	62.034	- 12.715
Sweden	115.593	131.712	- 16.119
Switzerland	61.670	78.735	- 17.065
United States	719.799	701.644	18.155
West Germany	404.899	456.098	- 51.198

Underdeveloped Regions

In the second class of equations, forty regressions were run from data in underdeveloped regions only. Excluding the results for 1967, in the other years studied, the correlations between the logarithms of money supply and national income in conjunction with stable velocity magnitudes permitted reasonably reliable projections of income to be generated from the equations. The simple correlation coefficients between the logarithms of money supply, exports and velocity in relation to the logarithms of national income are presented in Table XV.

TABLE XV

SIMPLE CORRELATION COEFFICIENTS BETWEEN THE LOGARITHMS
OF MONEY SUPPLY, EXPORTS, AND VELOCITY IN RELATION
TO THE LOGARITHMS OF NATIONAL INCOME,
UNDERDEVELOPED COUNTRIES, 1964-1968

Independent Variable	1964	1965	1966	1967	1968
M ₁	0.9840	0.9856	0.9852	0.6477	0.9836
M ₂	.9831	.8053	.9852	.6664	.9877
M ₃	.9800	.9830	.9816	.6699	.9813
M ₄	.9802	.8141	.9833	.6793	.9862
V	- .1209	- .0086	- .0858	- .0107	- .0971
E	0.9690	0.7328	0.9751	0.6944	0.9766

Unlike the developed regions, there appears to be, in certain instances, significant variation in the correlations between money supply and national income for the underdeveloped countries. In 1965, for example, money supplied defined as M₂ and M₄ exhibited simple correlations with national income of 0.8053 and 0.8141 respectively. However, for the same year, money defined as M₁ and M₃ displayed correlations with income of 0.9856 and 0.9830 respectively. Also, there does not appear from the data in Table XV that any particular definition of money consistently exhibited a higher relationship with national income than alternative definitions. In 1964 and 1965, for example, M₁ exhibited the highest relationship, while for 1966, M₂, as well as M₁, displayed the best correlations with income.

In addition, for 1967, M_4 exhibited the strongest relationship, and in 1968, M_2 displayed the best correlation.

Although variation existed between the correlations of income with the various definitions of money supply, excluding the results in 1967, the stock of money generally exhibited a correlation with income of 0.98. For 1967, as evidenced by Table XV, there was marked instability in the relationship between money and income. No definition for 1967 displayed a correlation coefficient in excess of 0.68. The conclusion to be reached, therefore, concerning the "proper" definition of money to be used for less developed countries is that it is considerably harder to isolate a definition that will be applicable for all countries. This suggests that, for underdeveloped regions, there is wide variation in the functional relationship between national income and money supply. It is more difficult, therefore, to establish a trend between monetary variables and national income for these regions. Obviously, then, the estimating equations for underdeveloped countries will be less reliable than those derived for developed countries.

The estimating equations for underdeveloped countries are presented in Table XVI. With the exception of 1967, the equations generally explained from ninety-seven percent to ninety-eight percent of the variation in the logarithms of national income. Although these are not as accurate as the estimating equations for developed countries, they are more accurate than

TABLE XVI
ESTIMATING EQUATIONS: UNDERDEVELOPED COUNTRIES

Year	Equation Constant	Regression Coefficients (Standard Error) (t-Value)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1964	1.4750	1.0090M ₁ (0.0269) (37.509)	0.1096V (0.0852) (1.286)	0.3205	0.9780	624.1357	0.000
	1.5354	.7025M ₁ (.1092) (6.433)	.2917E (.1341) (2.175)	.3954	.9720	521.8643	.000
	.9470	.9983M ₂ (.0312) (31.996)	.0769V (.0989) (0.777)	.3745	.9700	453.8701	.000
	1.1166	.7608M ₂ (.1260) (6.038)	.2300E (.1559) (1.475)	.4112	.9697	481.4961	.000
	1.1757	.9968M ₃ (.0333) (29.933)	.0825V (.1080) (.763)	.4083	.9644	379.7095	.000
	1.2961	.7031M ₃ (.1294) (5.433)	.2868E (.1623) (1.767)	.4369	.9681	424.9995	.000
	.7865	.9920M ₄ (.0345) (28.753)	.0633V (.1110) (0.570)	0.4215	0.9620	355.4351	0.000

TABLE XVI--Continued

Year	Equation Constant	Regression Coefficients (Standard Error) (t-Value)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1964	0.9854	0.7387M ₄	0.2503E	0.4358	0.9660	427.1824	0.000
		(.1352)	(.1697)				
		(5.463)	(1.474)				
1965	1.4566	1.0005M ₁	.1178V	.2987	.9840	893.9951	.000
		(.0223)	(.0712)				
		(44.865)	(1.654)				
	1.5726	.9551M ₁	.0430E	.3997	.9717	515.6907	.000
		(.0419)	(.0416)				
		(22.794)	(1.033)				
	1.2015	.8071M ₂	.0346V	1.4496	.6238	25.0418	.000
		(.0939)	(.3434)				
		(8.595)	(.100)				
	.7938	1.9650M ₂	-1.1814E	1.2685	.7148	38.5997	.000
		(.3554)	(.4051)				
		(5.528)	(-2.916)				
	1.1284	.9917M ₃	.0889V	.3942	.9722	507.6177	.000
		(.0288)	(.0937)				
		(34.434)	(.948)				
	1.2253	.9424M ₃	.0576E	.4304	.9672	442.7791	.000
		(.0438)	(.0444)				
		(21.515)	(1.297)				
	1.0413	0.8152M ₄	0.0261V	1.4208	0.6386	26.6203	0.000
		(.0919)	(.3364)				
		(8.870)	(0.077)				

TABLE XVI--Continued

Year	Equation Constant	Regression Coefficients (Standard Error)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1965	0.3914	2.0141M ₄	-1.2255E	1.2072	0.7417	44.0748	0.000
		(0.3257)	(0.3721)				
		(6.183)	(-3.293)				
1966	1.4340	1.0095M ₁	.1196V	.3118	.9832	879.9055	.000
		(.0227)	(.0745)				
		(44.471)	(1.605)				
	1.5286	.6682M ₁	.3265E	.3794	.9751	589.6221	.000
		(.1125)	(.1356)				
		(5.939)	(2.407)				
	.8870	.9992M ₂	.0833V	.3753	.9757	602.9963	.000
		(.0271)	(.0891)				
		(36.870)	(.934)				
	1.1128	.7105M ₂	.2811E	.4000	.9724	529.1201	.000
		(.1324)	(.1602)				
		(5.366)	(1.754)				
	1.1076	1.0002M ₃	.1000V	.4077	.9713	508.6895	.000
		(.0288)	(.0971)				
		(34.729)	(1.029)				
	1.2992	.6216M ₃	.3694E	.4282	.9684	459.9763	.000
		(.1323)	(.1638)				
		(4.698)	(2.2555)				
	0.7093	0.9953M ₄	0.0748V	0.4149	0.9703	490.8040	0.000
		(0.0294)	(0.0983)				
		(33.853)	(0.760)				

TABLE XVI--Continued

Year	Equation Constant	Regression Coefficients (Standard Error) (t-Value)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1966	0.9972	0.6732M ₄ (0.1388) (4.850)	0.3172E (0.1709) (1.856)	0.4216	0.9693	474.8479	0.000
		.6756M ₁ (.1121) (6.026)	.1428V (.4279) (.333)				
1967	1.6644	-.5084M ₁ (.4475) (-1.128)	1.1887E (.5667) (2.097)	1.8805	.3991	10.9621	.000
		.6850M ₂ (.1110) (6.171)	.1184V (.4178) (.293)				
	1.5963	-.3258M ₂ (.5250) (-1.620)	1.0134E (.6557) (1.545)	1.7824	.4602	13.7865	.000
		.6933M ₃ (.1086) (6.383)	.1329V (.4160) (.319)				
	1.7944	-.2056M ₃ (.5012) (-1.410)	.8954E (.6366) (1.406)	1.8490	.4191	11.8214	.000
		0.6964M ₄ (0.1087) (6.406)	0.1147V (0.4109) (0.279)				
	1.4260	0.6964M ₄ (0.1087) (6.406)	0.1147V (0.4109) (0.279)	1.7994	.4498	13.2652	.000
		1.7075	1.8038					.4277	12.2092	.000
	1.1722			1.8038	.4471	13.1319	.000

TABLE XVI--Continued

Year	Equation Constant	Regression Coefficients (Standard Error) (t-Value)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance			
		B ₁	B ₂							
1967	1.6929	-0.0380M ₄ (0.5417) (-0.070)	0.7316E (0.6791) (1.077)	1.8069	0.4452	13.0373	0.000			
		1.0111N ₁ (0.0258) (39.189)	0.1253V (0.0813) (1.541)							
		1.4722	.5862M ₁ (.1070) (5.478)					.4111E (.1275) (3.224)	.3798	.9759	526.7593	.000
.8571	.9985M ₂ (.0270) (36.981)	.0661V (.0858) (.770)	.3714	.9782	585.3879	.000				
1.0741	.6812M ₂ (.1054) (6.471)	.3157E (.1274) (2.478)					.3494	.9796					624.6902	.000
1.0610	1.0020M ₃ (.0307) (32.638)	.1034V (.0998) (1.036)							.4290	.9710	435.8015	.000
1.2698	.05497M ₃ (.1152) (4.771)	.4453E (.1418) (3.140)	0.4199	0.9716	446.2544	0.000				

TABLE XVI--Continued

Year	Equation Constant	Regression Coefficients (Standard Error) (t-Value)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1968	0.6711	0.9960M ₄ (0.0288) (34.583)	0.0617V (0.0933) (0.661)	0.4042	0.9742	492.4519	0.000
	0.9642	0.6485M ₄ (0.1109) (5.847)	0.3473E (0.1363) (2.548)	0.3730	0.9767	546.5757	0.000

the equations developed by Duggar. This suggests that, by sectoring the regions as developed and underdeveloped, more reliable estimates of income can be made. In addition, it should be noted that money defined as M_1 in conjunction with velocity and exports consistently yielded the most accurate estimating functions. This particular definition of money is the one Duggar employed when simultaneously estimating income for developed and less developed countries.

In 1964, all definitions of money supply in conjunction with exports and velocity yielded reasonably accurate estimating equations, explaining, as evidenced by the coefficients of determination, from ninety-six percent to greater than ninety-seven percent of the variations in national income. The best equation occurred in 1964 when money supply defined as M_1 was used in conjunction with velocity. For 1965, as implied earlier by the low correlation coefficients of M_2 and M_4 with national income, only money defined as M_1 and M_3 provided reliable estimating equations. When defined as M_2 or M_4 , money supply combined with velocity explained only sixty-two percent and sixty-three percent respectively of the variations in national income. In contrast, the money stock defined as M_1 and M_3 explained, in conjunction with velocity, ninety-eight percent and ninety-seven percent of the variation in income. In 1966, like the results obtained in 1964, all definitions of the stock of money combined with velocity yielded reliable estimating

equations. Again, the most reliable equation occurred when money supply defined as M_1 was combined with velocity. For 1968, the same results occurred with M_1 and velocity exhibiting the most reliable estimating equations. Therefore, although there was some question as to the best definition of money supply to be used for underdeveloped countries based on the simple correlation coefficients with national income, when combined with the other independent variables, money defined as M_1 consistently, with the exception of 1967, provided the most accurate estimating equations.

As suggested by the low correlation coefficients between money supply and national income in 1967, there were no reliable estimating equations derived for this year. When the various definitions of money were combined with velocity, the inclusion of the velocity figures, in all cases, reduced the explanatory power of the money stock. More important, when the supply of money was combined with exports, in all cases, exports explained the greatest variation in national income. In addition, the inclusion of money supply estimates actually reduced the variation in national income explained by exports. Even though there was significant interrelatedness between exports and money supply for all years studied, exports, not the stock of money, was the most important factor determining variations in national income for less developed regions in 1967. The best estimating equations were derived when money defined as M_1 was

used in conjunction with exports, explaining forty-six percent of the variation in national income. However, when combined with velocity, the stock of money designated as M_4 provided the best results, explaining forty-three percent of the variation in income. Given these results, then, it is questionable whether a uniform definition of money supply can be applied, at all times, to underdeveloped countries.

National income projections in 1968 for less developed regions used in deriving the estimating equations are presented in Table XVII. Appendix C contains income estimates covering the period 1964 to 1968. The estimating function used in deriving the income projections in Table XVII was:

$$\text{LogNI} = 1.3935 + 1.0111\text{Log } M_1 + 0.1253\text{LogV.}$$

For purposes of comparison, United Nations national income estimates are also presented in Table XVII.

Developed and Less Developed Regions

In the final series of regressions, estimating equations were derived from data taken from developed, as well as less developed countries. Slightly different results were obtained in these regressions than when equations were derived strictly for the less developed regions. However, the differences in this section were due to sampling error as will be explained later. Also, as will be shown, the instability in the relationships between monetary data and national income that characterized certain periods for the underdeveloped

TABLE XVII

ESTIMATED AND UNITED NATIONS NATIONAL INCOME PROJECTIONS
FOR THE UNDERDEVELOPED COUNTRIES USED IN
DERIVING THE ESTIMATING EQUATIONS, 1968
(Billions of Local Currency Units)

Country	United Nations Estimate (1)	Projected Income (2)	(1) - (2)
Bolivia	8.402	4.309	4.011
Brazil	76.789	82.712	- 5.922
Ceylon	9.362	9.737	- .374
China	133.200	162.546	- 29.346
Colombia	78.593	84.871	- 6.278
Costa Rica	4.156	4.871	- .715
Dominican Republic	.960	1.078	- .118
Ecuador	22.787	24.202	- 1.415
El Salvador	2.004	1.817	.186
Greece	179.400	124.590	54.809
Guatemala	1.343	.952	.391
Honduras	1.076	.819	.256
India	286.000	180.253	105.747
Israel	11.130	12.058	- .928
Jamaica	.665	.619	.045
Jordan	.171	.317	- .146
Korea	1328.700	1102.906	225.794
Libya	.798	.988	- .190
New Zealand	3.697	5.827	- 2.130
Nicaragua	4.219	3.828	.836
Pakistan	63.054	35.960	27.093
Philippines	23.575	26.104	- 2.529
Portugal	123.500	175.551	- 52.051
Sierra Leone	.259	.214	.044
South Africa	8.510	16.404	- 7.894
Spain	1512.900	1992.659	- 479.759
Venezuela	34.984	32.811	2.172

countries was also evident in the equations presented in this section. This was not surprising, however, since the number of underdeveloped countries used in deriving the trend equations was more than double the number of developed countries.

The simple correlation coefficients between the logarithms of money supply, velocity and exports in relation to the logarithms of national income for the period 1964 to 1968 are presented in Table XVIII.

TABLE XVIII

SIMPLE CORRELATION COEFFICIENTS BETWEEN THE LOGARITHMS OF MONEY SUPPLY, VELOCITY AND EXPORTS IN RELATION TO THE LOGARITHMS OF NATIONAL INCOME, DEVELOPED AND UNDERDEVELOPED COUNTRIES, 1964-1968

Independent Variable	1964	1965	1966	1967	1968
M ₁	0.9891	0.9899	0.9897	0.7835	0.9895
M ₂	.9864	.8894	.9877	.8019	.9903
M ₃	.9854	.9873	.9868	.8051	.9879
M ₄	.9842	.8959	.9863	.8123	.9893
V	- .0089	.0397	.0000	.0394	- .0185
E	0.9744	0.8411	0.9782	0.8196	0.9804

As evidenced by Table XVIII, there is generally a high correlation between the logarithms of money supply and national income. However, like the underdeveloped regions, there are certain instances of marked instability. In 1964, for example, all definitions of money exhibited coefficients in excess of 0.98, while in 1965 only money defined as M₁ and M₃ displayed such correlations. It should be noted that, for less developed countries in 1964 and 1965, a similar relationship existed.

Table XVIII is in fact very analogous to Table XV. This, of course, reflects the strong influence on the trend of the instability in the relationships that characterized the regressions derived from underdeveloped countries. As evidenced by the similarity between Tables XV and XVIII, then, like the underdeveloped countries, there will be an adverse effect on the accuracy of the equations derived in this section.

The estimating equations for developed and underdeveloped countries are presented in Table XIX. With the exception of 1967, the equations generally explained from ninety-seven percent to ninety-eight percent of the variations in national income between regions.

In 1964, money supply defined as M_1 in conjunction with velocity provided the greatest explanatory power of variations in national income as evidenced by a coefficient of determination of 0.9827. It should be noted that, for developed countries in 1964, the estimating equations explained from ninety-eight percent to greater than ninety-nine percent of the variations in national income, while for less developed countries the coefficients of determination were similar in magnitude to those achieved in this section. In fact, for all years studied, the equations derived in this section are less accurate than those established for developed nations, and slightly more reliable than those obtained strictly for less developed regions.

TABLE XIX
ESTIMATING EQUATIONS: DEVELOPED AND UNDERDEVELOPED COUNTRIES

Year	Equation Constant	Regression Coefficients (Standard Error) (t-Value)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1964	1.4791	0.9951M ₁ (0.0188) (52.930)	0.0734V (0.0656) (1.1189)	0.3317	0.9827	1168.3477	0.000
	1.5101	.7946M ₁ (.0936) (8.489)	.1991E (.1099) (1.811)	.3924	.9788	995.2651	.000
	.9579	.9892M ₂ (.0224) (44.160)	.0487V (.0804) (.605)	.4071	.9740	768.9111	.000
	1.0552	.8162M ₂ (.1097) (7.440)	.1743E (.1332) (1.308)	.4305	.9745	823.5313	.000
1964	1.1656	.9872M ₃ (.0233) (42.369)	.0384V (.0846) (.453)	.4289	.9711	691.0310	.000
	1.2146	.7736M ₃ (.1070) (7.229)	.2172E (.1313) (1.654)	.4391	.9735	790.5259	.000
1964	0.7937	.9854M ₄ (.0243) (40.551)	.0308V (.0889) (.346)	0.4508	0.9681	623.6138	0.000

TABLE XIX--Continued

Year	Equation Constant	Regression Coefficients (Standard Error)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1964	0.9147	0.7758M ₄ (0.1133) (6.847)	0.2139E (0.1403) (1.524)	0.4529	0.9718	742.0710	0.000
1965	1.4606	.9931M ₁ (.0170) (58.417)	.0801V (.0592) (1.353)	.3202	.9857	1448.5195	.000
	1.5493	.9580M ₁ (.0361) (26.537)	.0385E (.0389) (.989)	.3792	.9803	1069.6108	.000
	1.1062	.8894M ₂ (.0615) (14.461)	0402V (.2311) (.173)	1.2492	.7823	76.4632	.000
	.8491	1.7086M ₂ (.2723) (6.274)	-.8319E (.3167) (2.626)	1.1476	.8193	98.5022	.000
	1.1171	.9874M ₃ (.0214) (46.140)	.0434V (.0776) (.559)	.4196	.9754	835.1672	.000
	1.1665	.9383M ₂ (.0380) (24.692)	.0593E (.0426) (1.392)	.4211	.9757	863.2502	.000
	0.9180	0.8954M ₄ (0.0593) (15.099)	0.0249V (0.2251) (0.110)	1.2171	0.7933	81.6137	0.000

TABLE XIX--Continued

Year	Equation Constant	Regression Coefficients (Standard Error)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B1	B2				
1965	0.4747	1.7154M4 (0.2441) (7.027)	-0.8346E (0.2873) (2.904)	1.0980	0.8346	109.5059	0.000
1966	1.4543	.9961M1 (.0171) (58.251)	.0798V (.0597) (1.336)	.3309	.9852	1427.4541	.000
	1.5254	.7746M1 (.0967) (8.010)	.2196E (.1127) (1.948)	.3784	.9806	1086.7441	.000
	.9090	.9902M2 (.0207) (47).835)	.0499V (.0741) (.673)	.4116	.9770	915.5042	.000
	1.0617	.7728M2 (.1143) (6.761)	.2186E (.1371) (1.594)	.4196	.9761	880.1782	.000
	1.1215	.9890M3 (.0213) (46.431)	.0476V (.0776) (.613)	.4308	.9748	833.8252	.000
	1.2306	.7155M3 (.1068) (6.699)	.2766E (.1302) (2.124)	.4246	.9756	859.2217	.000
	0.7343	0.9875M4 (0.0220) (6.341)	0.0350V (0.0806) (1.928)	0.4476	0.9728	771.0193	0.000

TABLE XIX--Continued

Year	Equation Constant	Regression Coefficients (Standard Error) (t-Value)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1966	0.9320	0.7223M ₄ (0.1139) (6.341)	0.2688E (0.1394) (1.928)	0.4358	0.9742	814.3574	0.000
1967	1.6834	.7977M ₁ (.0806) (9.897)	.1279V (.2972) (.430)	1.6984	.6120	34.9180	.000
	1.5490	-.3449M ₁ (.3438) (1.003)	1.1562E (.4165) (2.775)	1.5863	.6616	43.0282	.000
	1.2067	.8095M ₂ (.0771) (10.499)	.1009V (.2869) (.351)	1.6445	.6363	38.6080	.000
	1.6476	-.0795M ₂ (.3956) (.200)	.8976E (.4834) (1.856)	1.5995	.6559	41.9798	.000
	1.3616	.8126M ₃ (.0753) (10.791)	.1005V (.2847) (.353)	1.6324	.6416	39.4893	.000
	1.6060	.0481M ₃ (.3705) (.129)	.7723E (.4604) (1.677)	1.5998	.6557	41.9541	.000
	1.0335	0.8174M ₄ (0.0745) (10.971)	0.0878V (0.2806) (0.312)	1.6103	0.6512	41.1465	0.000

TABLE XIX--Continued

Year	Equation Constant	Regression Coefficients (Standard Error) (t-Value)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1967	1.4896	0.2076M ₄ (0.3918) (0.529)	0.6155E (0.4849) (1.269)	1.5963	0.6573	42.2286	0.000
1968	1.4212	.9970M ₁ (.0184) ¹ (54.184)	.0779V (.0628) (1.240)	.3557	.9844	1228.4897	.000
	1.4689	.7002M ₁ (.0922) ¹ (7.594)	.2959E (.1069) (2.768)	.3772	.9821	1073.3198	.000
	.8620	.9923M ₂ (.0196) (50.267)	.0370V (.0690) (.536)	.3917	.9810	1010.1360	.000
	1.0068	.7609M ₂ (.0958) (7.942)	.2341E (.1144) (2.046)	.3738	.9825	1093.0049	.000
	1.0749	.9907M ₃ (.0213) ³ (46.511)	.0450V (.0765) (.588)	.4340	.9767	819.2219	.000
	1.1938	0.6645M ₃ (0.0949) ³ (7.002)	0.3306E (0.1155) (2.862)	0.4040	0.9795	932.9863	.000

TABLE XIX--Continued

Year	Equation Constant	Regression Coefficients (Standard Error)		Standard Error of Estimate	Coefficient of Determination	F-Value	Level of Significance
		B ₁	B ₂				
1968	0.6785	0.9903M ₄	0.0243V	0.4197	0.9782	877.2122	0.000
		(0.0205) (48.307)	(0.0739) (0.388)				
	0.8730	0.7236M ₄	0.2713B	0.3882	0.9811	1011.9026	0.000
		(0.0954) (7.584)	(0.1165) (2.328)				

Testimony to this conclusion is further evidenced by the results obtained in 1967. The equations derived in this section yielded coefficients of determination ranging from 0.6120 to 0.6616. For developed countries, the coefficients ranged from 0.9800 to 0.9950 in 1967, while for less developed nations, the coefficients varied from a low of 0.3991 to a high of 0.4602.

The national income estimates for 1968 derived simultaneously for developed and underdeveloped countries are presented in Table XX. Estimates covering the period 1964 to 1968 are presented in Appendix C. The estimating equation used for the projections in Table XX was:

$$\text{LogNI} = 1.4212 + 0.0997\text{LogM}_1 + 0.0779\text{LogV}.$$

Also presented in Table XX are United Nations national income projections for 1968.

TABLE XX

ESTIMATED AND UNITED NATIONS NATIONAL INCOME PROJECTIONS
FOR THE COUNTRIES USED IN DERIVING THE
ESTIMATING EQUATIONS, 1968
(Billions of Local Currency Units)

Country	United Nations Estimate (1)	Estimated Income (2)	(1) - (2)
Australia	21.391	24.410	- 3.019
Austria	218.900	265.754	- 46.854
Canada	50.458	68.315	- 17.857
Denmark	71.579	78.780	- 7.201
Finland	26.424	16.006	10.417
Italy	37,884.0	30,651.0	7,232.0

TABLE XX--Continued

Country	United Nations Estimate (1)	Estimated Income (2)	(1) - (2)
Japan	40,817.0	43,242.0	-2,425.0
Netherlands	74.000	73.450	.550
Norway	49.319	48.810	.509
Sweden	115.593	123.879	- 8.277
Switzerland	61.670	150.007	- 88.337
United States	719.800	764.299	- 44.499
West Germany	404.900	556.485	- 151.585
Bolivia	8.402	5.037	3.364
Brazil	76.790	74.264	2.526
Ceylon	9.363	9.266	.096
China	133.200	137.331	- 4.131
Colombia	78.593	69.576	9.016
Costa Rica	4.156	4.565	- .409
Dominican Republic	.960	1.032	- .072
Ecuador	22.787	20.902	1.885
El Salvador	2.004	1.732	.271
Greece	179.400	127.579	51.821
Guatemala	1.343	.846	.497
Honduras	1.076	.811	.264
India	286.000	162.145	123.855
Israel	11.130	11.673	- .543
Jamaica	.665	.676	- .011
Jordan	.171	.413	- .242
Korea	1,328.700	848.260	480.440
Libya	.798	1.128	- .330
New Zealand	3.697	5.440	- 1.743
Nicaragua	4.219	3.104	1.114
Pakistan	63.054	35.854	27.200
Philippines	23.575	22.441	1.133
Portugal	123.500	183.600	- 60.100
Sierra Leone	.259	.215	.044
South Africa	8.510	13.858	- 5.348
Spain	1,512.900	1,760.667	- 247.767
Venezuela	34.984	28.935	6.049

Although variation exists between the coefficients of determination for the three classes of regressions, the hypothesis

that there is no significant difference between the population coefficients cannot be rejected at the .05 level of confidence. The differences in the coefficients of determination are due to sampling error, and therefore it cannot be argued, as previously suggested, that more reliable income estimates can be achieved by sectoring the nations as developed and underdeveloped. Testimony to this conclusion is provided in Appendix C by the computed t-values presented in Tables XXVIII, XXIX, and XXX. In order to reject the hypothesis that there is no significant difference in the population parameters, the computed t-values must exceed 1.96.

CHAPTER IV

CONCLUSION

In evaluating the feasibility of estimating national income from data on the stock of money and velocity, it must be conceded that, when viewed in terms of accuracy, monetary data can be highly useful predictors of income. As was shown, the data in some instances explained greater than ninety-nine percent of the variation in the logarithms of national income between nations. Therefore, simply in terms of reliability, it is clear that monetary estimates of national income are as acceptable as traditional measures. Yet, in weighing the desirability of using the equation of exchange to generate statistics on national expenditure, other, equally relevant factors must be considered.

First, although data on money supply and velocity yielded estimates of income commensurate with those generated by conventional techniques, it must be remembered that United Nations estimates, especially when applied to less developed countries, are dubious. In effect, then, monetary estimates of national income are, at most, only approximations to tenuous estimates.

Second, national income derived from data on money supply and velocity provide little in the way of informative statistics. As mentioned earlier, Kuznets has stated that the

motivating factor in securing national income estimates was "to find a basis upon which both the parts and the whole can be measured to secure comparable magnitudes."¹ To put the matter differently, when traditional techniques are used to predict income, not only is a total given, but the amount of income contributed from the various sectors of the economy is revealed. This, then, allows a more complete analysis, as well as a more illuminative view of the functional interrelationships that exist in an economy for some specified period of time. Unfortunately, this is not the case when income statistics are generated from some transformation of the equation of exchange. Using such techniques, all that can be said if income changes is that either money supply or velocity fluctuated, or both. To the extent that a change in income originated in the public or private sector, or from some developmental program, nothing can be stated conclusively. For underdeveloped regions, the knowledge that is not obtained when predicting income from money supply and velocity is probably more important than simply the income statistic it provides.

Finally, to the extent that income estimates generated from monetary data are slightly less reliable, but substantially less useful than conventional estimates, suggests that any argument in favor of predicting output from the equation of

¹Daniel Creamer, "Uses of National Income Estimates in Under-Developed Areas," Income and Wealth, edited by Milton Gilbert (Baltimore, 1953), p. 215.

exchange reflects either a paucity of data or, more importantly, "a naive belief," on the part of some, "that economic salvation can be achieved by the creation of statistical measures."² In an attempt to bridge the statistical gap between the advanced and less advanced nations, Duggar has avoided the central problem: a lack of reliable data from which to generate income estimates. The lack of available data has been the nemesis of theorists attempting to measure aggregate income in less developed regions. Even though estimates generated from monetary data are relatively easy to acquire, it seems more specious to breach the problems inherent with an inaccessibility of accurate data rather than develop techniques which yield spurious results. Although there is a prevailing tendency among some econometricians to develop maverick estimating techniques, it must be remembered that such measures are no substitute for reliable data.

The preceding paper has explored the fact that even though highly accurate estimates of income can be generated from monetary data, the estimates, nevertheless, represent no solution to the problems inherent in income estimation. As suggested, there is no adequate theory available from which to predict income from data on the stock of money and velocity. This is reflected in the fact that projections derived from monetary data had to be calculated and evaluated in terms of conventional

²Ibid., p. 222.

estimates, that is, a purely empirical approach had to be employed. Also, since the equations developed earlier explained such a large proportion of the variation in income between nations, they are, for all intents and purposes, the best that can be expected using monetary data.

Given the above argument, it is not necessarily correct to infer that the study is fruitless. The problem of obtaining reliable income estimates still exists, and the paper points out the inadequacy of a prevalent estimating procedure currently being employed as a substitute for reliable data. The main point to be made is that theorists, if they are to achieve acceptable income projections, must discover methods of dealing with non-monetary data.

APPENDIX

APPENDIX A

TABLE XXI

MONETARY DATA USED IN DERIVING THE INCOME ESTIMATES

Year	Currency Outside Banks (1)	Demand Deposits (2)		Claims on Private Sector (3)	Personal Savings Deposits (4)	Bank Debits (5)
		Private	Government			
AUSTRALIA (Billions of Australian Dollars)						
1964	0.866	3.120	0.213	4.154	6.322	8.837
1965	.828	3.075	.245	4.743	6.938	9.382
1966	.909	3.291	.238	5.249	7.483	10.064
1967	.992	3.500	.286	6.034	8.244	11.280
1968	1.069	3.678	.307	6.695	8.883	13.379
AUSTRIA (Billions of Schillings)						
1964	26.11	21.25	3.32	85.48	72.06	94.08
1965	28.01	23.48	2.88	100.13	82.45	105.13
1966	30.26	23.71	2.49	115.01	93.70	122.45
1967	31.76	25.66	2.29	123.95	104.28	130.10
1968	32.89	28.40	1.94	135.11	116.27	142.40
BOLIVIA (Billions of Pesos)						
1964	.6577	.1450	.1713	.2495	.0311	.166
1965	.8067	.2044	.1792	.2699	.0424	.168
1966	.8825	.2708	.3036	.3573	.0811	.190
1967	.9046	.2873	.3140	.3898	.1250	.212
1968	.9485	.3384	.3340	.5206	.2009	.246
BRAZIL (Billions of Cruzeiros)						
1964	1.156	4.035	. . .	3.631	.148	3.921
1965	1.731	7.374	. . .	5.688	.242	6.703
1966	2.343	8.176	. . .	8.605	.712	10.681
1967	2.944	11.987	. . .	12.018	1.194	14.840
1968	4.163	17.272	. . .	19.082	2.538	24.897
CANADA (Billions of Canadian Dollars)						
1964	2.25	6.16	.70	10.61	8.94	35.86
1965	2.42	7.20	.80	12.28	9.72	40.92
1966	2.58	7.74	.92	13.03	10.25	44.82
1967	2.82	9.10	.62	15.11	11.76	48.76
1968	3.05	10.51	.67	17.17	13.62	53.06

TABLE XXI--Continued

Exports	M ₁	M ₂	M ₃	M ₄	V	National Income
	(1+2)	(1+2+3)	(1+2+4)	(1+2+3+4)	(5+2)	
AUSTRALIA (Billions of Australian Dollars)						
3.048	4.199	4.353	10.521	14.675	2.651	15.804
3.137	4.148	8.891	11.086	15.829	2.825	16.406
3.469	4.438	9.687	11.921	17.170	2.851	18.055
3.555	4.778	10.812	13.022	19.056	2.979	18.982
3.890	5.054	11.749	13.937	20.632	3.357	21.391
AUSTRIA (Billions of Schillings)						
56.5	50.68	136.16	122.74	208.22	3.829	167.9
62.1	54.37	154.50	136.82	236.95	3.988	182.4
66.0	56.46	171.47	150.16	265.17	4.673	197.3
70.3	59.71	183.66	163.99	287.94	4.654	210.2
78.1	63.23	198.34	179.50	314.61	4.693	218.9
BOLIVIA (Billions of Pesos)						
1.337	.974	1.224	1.005	1.255	.525	5.672
1.540	1.190	1.460	1.232	1.502	.374	6.334
1.743	1.458	1.815	1.539	1.896	.330	6.814
2.015	1.506	1.896	1.631	2.021	.352	7.357
2.010	1.621	2.147	1.822	2.343	.366	8.402
BRAZIL (Billions of Cruzeiros)						
1.721	5.191	8.552	5.339	8.970	.971	18.9
3.246	9.105	14.793	9.347	15.035	.909	29.8
4.074	10.519	19.124	11.231	19.836	1.306	42.4
4.738	14.931	26.949	16.125	28.143	1.238	60.8
6.856	21.435	40.517	23.873	43.955	1.441	76.8
CANADA (Billions of Canadian Dollars)						
10.208	9.11	19.72	18.05	28.66	5.227	35.289
10.901	10.42	22.70	20.14	32.42	5.115	38.784
12.770	11.24	24.27	21.49	34.52	5.175	43.132
14.414	12.54	27.65	24.30	39.41	5.016	46.075
16.353	14.23	31.40	27.85	45.02	4.745	50.458

TABLE XXI--Continued

Year	Currency Outside Banks (1)	Demand Deposits (2)		Claims on Private Sector (3)	Personal Savings Deposits (4)	Bank Debits (5)
		Private	Government			
CEYLON (Billions of Rupees)						
1964	0.853	0.754	0.170	0.730	0.993	1.275
1965	.901	.791	.180	.715	1.063	1.349
1966	.883	.757	.243	.766	1.086	1.323
1967	.980	.805	.187	.922	1.200	1.366
1968	1.066	.823	.257	1.191	1.340	1.684
CHILE (Billions of Escudos)						
1964	.485	.640	.439	1.525	.531	2.908
1965	.725	1.137	.484	2.077	.657	4.473
1966	1.020	1.567	.752	2.684	1.033	6.737
1967	1.308	1.922	.726	3.484	1.314	9.439
1968	1.697	2.774	1.273	4.747	1.980	. . .
CHINA, REPUBLIC OF (Billions of NT Dollars)						
1964	5.20	8.23	3.65	17.52	20.80	30.17
1965	5.78	9.07	5.29	22.41	24.25	31.40
1966	6.58	10.81	8.00	26.43	30.94	35.11
1967	8.36	13.74	9.51	32.92	37.26	45.17
1968	9.41	15.48	13.35	42.21	41.65	59.26
COLOMBIA (Billions of Pesos)						
1964	3.161	5.248	.243	8.968	2.277	19.060
1965	3.637	6.068	.277	10.720	2.576	22.690
1966	4.149	6.895	.418	13.225	2.803	24.805
1967	4.818	8.669	.472	15.282	3.381	27.993
1968	5.613	9.858	.622	18.373	4.140	33.821
COSTA RICA (Billions of Colones)						
1964	.229	.3390	.0188	.841	.1449	.795
1965	.237	.3597	.0234	.923	.1490	.871
1966	.253	.3671	.0252	.940	.1634	.960
1967	.282	.5469	.0157	.984	.2023	1.058
1968	0.306	0.5755	0.0234	1.024	0.2252	1.298

TABLE XXI--Continued

Exports	M ₁	M ₂	M ₃	M ₄	V	National Income
	(1+2)	(1+2+3)	(1+2+4)	(1+2+3+4)	(5+2)	
CEYLON (Billions of Rupees)						
1.937	1.777	2.507	2.770	3.500	1.379	6.939
2.094	1.872	2.587	2.935	3.650	1.389	7.082
1.865	1.883	2.649	2.969	3.735	1.323	7.317
1.849	1.972	2.894	3.172	4.094	1.377	7.842
2.165	2.146	3.337	3.486	4.677	1.559	9.363
CHILIE (Billions of Escudos)						
1.644	1.564	3.089	2.095	3.620	2.695	10.128
2.515	2.346	4.423	3.003	5.080	2.759	14.118
3.894	3.339	6.023	4.372	6.740	2.905	19.631
4.931	3.956	7.440	5.270	8.754	3.564	25.408
6.470	5.744	10.491	7.724	12.471	. . .	33.905
CHINA, REPUBLIC OF (Billions of NT Dollars)						
19.20	17.08	34.60	37.88	55.40	2.539	84.6
20.81	20.14	42.55	44.39	66.80	2.186	91.6
26.10	25.39	51.82	56.33	82.76	1.866	102.0
31.51	31.61	64.53	68.87	101.79	1.942	115.2
41.13	38.24	80.45	79.89	122.10	2.055	133.2
COLOMBIA (Billions of Pesos)						
6.376	8.652	17.620	10.929	19.897	3.471	45.356
6.943	9.982	20.702	12.558	23.278	3.576	51.000
8.916	11.462	24.687	14.265	27.490	3.391	60.360
9.950	13.959	29.241	17.340	32.622	3.062	68.802
12.520	16.093	34.446	20.233	38.606	3.227	78.593
COSTA RICA (Billions of Colones)						
.887	.586	1.527	.731	1.572	2.221	2.999
.896	.620	1.543	.779	1.702	2.247	3.253
1.072	.645	1.585	.808	1.748	2.447	3.474
1.168	.844	1.828	1.046	2.030	1.880	3.787
1.445	0.904	1.928	1.130	2.154	2.167	4.156

TABLE XXI--Continued

Year	Currency Outside Bank (1)	Demand Deposits (2)		Claims on Private Sector (3)	Personal Savings Deposits (4)	Bank Debits (5)
		Private	Government			
DENMARK (Billions of Kroner)						
1964	3.87	11.57	2.85	29.65	15.70	10.67
1965	4.16	13.13	3.26	33.42	16.96	11.52
1966	4.56	15.19	4.21	39.00	19.00	12.10
1967	4.75	16.78	3.39	42.22	20.84	12.85
1968	4.88	20.24	3.06	48.33	23.26	15.36
DOMINICAN REPUBLIC (Billions of Pesos)						
1964	.0667	.0499	.0197	.0781	.0308	.2017
1965	.0753	.0597	.0192	.0764	.0353	. . .
1966	.0647	.0514	.0280	.0824	.0456	.2175
1967	.0590	.0633	.0231	.1414	.0432	.2268
1968	.0648	.0664	.0359	.1771	.0722	.2792
ECUADOR (Billions of Sucres)						
1964	1.136	1.441	.480	3.400	.544	5.169
1965	1.236	1.405	.290	3.425	.605	5.528
1966	1.347	1.660	.419	3.650	.713	5.926
1967	1.404	1.902	.542	4.199	.891	6.841
1968	1.600	2.307	.537	5.032	1.195	8.178
EL SALVADOR (Billions of Colones)						
1964	.119	.127	.0217	.401	.187	.346
1965	.114	.138	.0384	.436	.202	.389
1966	.117	.143	.0191	.477	.230	.410
1967	.124	.141	.0151	.488	.234	.439
1968	.116	.165	.0223	.499	.243	.458
FINLAND (Billions of New Markkaa)						
1964	.892	1.508	.556	9.475	8.160	2.227
1965	.933	1.536	.635	10.649	9.204	2.552
1966	1.026	1.529	.738	12.025	10.443	2.810
1967	.958	1.605	.777	13.777	11.435	3.119
1968	1.088	2.025	1.182	14.679	12.756	3.505
GREECE (Billions of Drachmas)						
1964	20.31	10.87	1.60	18.20	28.80	5.08
1965	23.44	11.65	1.83	20.96	30.91	5.87
1966	26.30	13.44	3.05	24.07	37.26	6.81
1967	33.67	13.80	3.97	27.60	41.12	7.87
1968	33.36	17.24	4.12	30.18	51.44	8.48

TABLE XXI--Continued

Exports	M ₁	M ₂	M ₃	M ₄	V	National Income
	(1+2)	(1+2+3)	(1+2+4)	(1+2+3+4)	(5+2)	
DENMARK (Billions of Kroner)						
18.996	18.30	47.95	34.00	63.65	0.739	49.533
20.925	20.55	53.97	37.51	70.93	.702	55.334
22.396	23.96	62.96	42.96	81.96	.623	60.92
23.592	24.92	67.14	45.76	87.98	.637	65.979
26.398	28.18	76.51	51.44	99.77	.659	71.579
DOMINICAN REPUBLIC (Billions of Pesos)						
.2020	.1363	.2144	.1671	.2452	2.897	.885
.1448	.1542	.2306	.1895	.2659	. . .	.799
.1608	.1441	.2265	.1897	.2721	2.739	.864
.1867	.1454	.2868	.1986	.3400	2.625	.898
.2008	.1671	.3442	.2393	.4165	2.729	.960
ECAUDOR (Billions of Sucres)						
3.245	3.157	6.557	3.701	7.101	2.557	16.083
3.618	2.931	6.356	3.536	6.961	3.261	17.489
3.726	3.426	7.076	4.139	7.789	2.850	19.276
4.041	3.848	8.047	4.739	8.938	2.799	20.994
4.257	4.444	9.476	5.639	10.671	2.875	22.787
EL SALVADOR (Billions of Colones)						
.477	.267	.668	.454	.855	2.326	1.610
.529	.290	.716	.492	.918	2.205	1.707
.521	.279	.756	.509	.986	2.529	1.826
.567	.280	.768	.514	1.002	2.812	1.925
.585	.303	.802	.546	1.045	2.445	2.004
FINLAND (Billions of New Markkaa)						
4.984	2.956	12.431	11.116	20.591	1.078	18.771
5.496	3.104	13.753	12.308	22.957	1.175	20.560
5.824	3.293	15.318	13.736	25.761	1.239	22.029
6.358	3.340	17.117	.41775	28.552	1.309	23.723
8.355	4.295	18.974	17.051	31.730	1.092	26.424
GREECE (Billions of Drachmas)						
14.5	32.78	50.98	61.58	79.78	.407	129.4
16.1	36.92	57.88	67.83	88.79	.435	145.4
22.4	42.79	66.86	80.05	104.12	.412	159.3
23.0	51.44	79.04	92.56	120.16	.442	170.1
22.5	54.72	84.90	106.16	136.34	0.397	179.4

TABLE XXI--Continued

Year	Currency Outside Banks (1)	Demand Deposits (2)		Claims on Private Sector (3)	Personal Savings Deposits (4)	Bank Debits (5)
		Private	Government			
GUATEMALA (Billions of Quetzales)						
1964	0.0721	0.0178	0.0179	0.1385	0.0826	0.1057
1965	.0767	.0198	.0234	.1520	.0974	.1170
1966	.0811	.0188	.0150	.1676	.0110	.1341
1967	.0824	.0207	.0091	.1970	.0124	.1343
1968	.0834	.0198	.0078	.2236	.0139	.1541
HONDURAS (Billions of Lempiras)						
1964	.046	.0436	.0089	.0778	.0387	.0887
1965	.051	.0541	.0012	.0941	.0455	.1045
1966	.054	.0531	.0017	.1153	.0577	.1195
1967	.056	.0646	.0022	.1427	.0697	.1376
1968	.061	.0725	.0016	.1714	.0983	.1639
ICELAND (Billions of Kronur)						
1964	.740	1.415	.683	6.629	4.983	1.978
1965	.970	1.710	.863	8.288	6.196	2.452
1966	1.039	1.793	.894	9.693	7.183	2.953
1967	.968	1.637	.683	10.055	7.799	3.079
1968	.956	1.933	.951	11.496	8.417	3.293
INDIA (Billions of Rupees)						
1964	26.61	12.22	.65	22.96	18.30	14.90
1965	28.65	14.14	.59	26.29	22.18	17.08
1966	30.08	16.37	.66	30.55	25.58	19.00
1967	32.10	18.50	.60	34.28	27.95	20.56
1968	33.72	19.27	.70	39.10	32.67	22.77
ISRAEL (Billions of Israel Pounds)						
1964	.590	1.117	.254	1.210	.709	1.542
1965	.657	1.242	.130	1.386	.871	1.844
1966	.751	1.251	.048	1.720	1.147	2.005
1967	.966	1.573	.561	2.360	1.960	1.967
1968	1.092	1.807	.027	3.094	2.823	2.310
ITALY (Hundred Billions of Lire)						
1964	38.46	84.63	. . .	158.44	125.93	52.09
1965	41.89	101.01	. . .	176.03	144.53	53.35
1966	45.68	116.21	. . .	201.79	165.03	64.34
1967	50.55	136.10	. . .	237.48	184.17	69.69
1968	52.62	156.12	. . .	266.72	204.30	78.27

TABLE XXI--Continued

Exports	M ₁	M ₂	M ₃	M ₄	V	National Income
	(1+2)	(1+2+3)	(1+2+4)	(1+2+3+4)	(5+2)	
GUATEMALA (Billions of Quetzales)						
0.1951	0.1078	0.2463	0.1904	0.3289	2.960	1.133
.2235	.1200	.2720	.2174	.3694	2.702	1.153
.2635	.1149	.2825	.1259	.2935	3.967	1.211
.2372	.1122	.3092	.1246	.3216	4.506	1.254
.2689	.1110	.3346	.1249	.3485	5.583	1.343
HONDURAS (Billions of Lempiras)						
.2019	.098	.176	.137	.215	1.689	.807
.2730	.106	.200	.151	.245	1.889	.894
.3085	.108	.223	.165	.281	2.180	.946
.3348	.122	.265	.192	.335	2.059	1.012
.3865	.135	.306	.233	.404	2.211	1.076
ICELAND (Billions of Kronur)						
6.983	2.838	9.467	7.821	14.450	.942	13.218
8.262	3.543	11.831	9.739	18.027	.952	15.091
8.998	3.726	13.416	10.909	20.869	1.098	17.534
7.705	3.288	13.343	11.087	21.142	1.327	17.405
9.510	3.840	15.336	12.257	23.753	1.141	. . .
INDIA (Billions of Rupees)						
10.1	39.48	62.44	57.78	80.74	1.157	201.0
9.5	43.38	69.67	65.56	91.85	1.159	206.0
13.2	47.11	77.66	72.69	103.24	1.115	236.8
15.0	51.20	85.48	79.15	113.43	1.076	279.5
. . .	53.69	92.79	86.36	125.46	1.140	286.0
ISRAEL (Billions of Israel Pounds)						
1.834	1.961	3.171	2.670	3.880	1.124	6.971
2.072	2.029	3.415	2.900	4.286	1.344	8.436
2.419	2.056	3.776	3.203	4.923	1.536	9.258
2.693	3.100	5.460	5.060	7.420	.918	9.526
3.868	2.926	6.020	5.749	8.843	1.259	11.130
ITALY (Hundred Billions of Lire)						
51.48	123.09	281.53	249.02	407.46	.617	275.91
61.68	142.90	318.93	287.43	463.46	.610	296.65
68.78	161.89	363.68	326.92	528.71	.591	322.35
74.42	186.65	424.13	370.82	608.30	.512	351.74
85.26	208.74	475.46	413.04	679.76	.501	378.84

TABLE XXI--Continued

Year	Currency Outside Banks (1)	Demand Deposits (2)		Claims on Private Sector (3)	Personal Savings Deposits (4)	Bank Debits (5)
		Private	Government			
JAMAICA (Billions of Jamaican Dollars)						
1964	0.0226	0.0440	0.0392	0.1044	0.0926	0.0628
1965	.0238	.0398	.0376	.1270	.1044	.0686
1966	.0254	.0456	.0364	.1350	.1220	.0764
1967	.0278	.0476	.0338	.1458	.1368	.0834
1968	.0316	.0634	.0430	.1738	.1762	.1048
JAPAN (Hundred Billions of Yen)						
1964	19.87	67.17	1.97	236.51	128.18	245.39
1965	22.64	80.23	2.72	273.73	151.07	271.58
1966	25.89	91.27	1.67	319.15	178.06	307.10
1967	31.14	102.55	34.52	370.69	286.35	358.24
1968	35.95	115.60	42.32	421.63	335.48	428.65
JORDAN (Billions of Dinars)						
1964	.0230	.0167	.0257	.0294	.0138	. . .
1965	.0263	.0207	.0157	.0337	.0169	.0124
1966	.0303	.0257	.0163	.0397	.0197	.0182
1967	.0515	.0237	.0272	.0398	.0187	.0138
1968	.0635	.0244	.0286	.0420	.0204	.0127
KOREA (Billions of Won)						
1964	24.94	24.52	50.94	49.07	14.50	177.42
1965	31.63	34.93	52.26	77.91	30.57	222.45
1966	42.90	43.49	66.25	110.64	70.08	260.02
1967	57.61	64.72	79.39	210.26	128.90	355.22
1968	81.94	73.75	103.51	389.43	255.54	494.11
LIBYA (Billions of Libyan Pounds)						
1964	.0245	.0201	.0402	.0280	.0100	.0402
1965	.0336	.0331	.0532	.0352	.0141	.0532
1966	.0477	.0458	.0718	.0473	.0165	.0718
1967	.0610	.0602	.0863	.0542	.0198	.0863
1968	.0704	.0870	.1209	.0734	.0209	.1209
MEXICO (Billions of Pesos)						
1964	12.00	15.51	. . .	22.13	22.02	52.60
1965	12.58	16.56	. . .	20.14	25.92	59.85
1966	13.70	18.64	. . .	22.53	27.45	72.16
1967	14.82	19.99	. . .	25.37	26.51	82.27
1968	16.75	23.65	. . .	27.02	27.23	93.99

TABLE XXI--Continued

Exports	M ₁	M ₂	M ₃	M ₄	V	National Income
	(1+2)	(1+2+3)	(1+2+4)	(1+2+3+4)	(5+2)	
JAMAICA (Billions of Jamaican Dollars)						
0.2180	0.105	0.210	0.198	0.302	0.754	0.489
.2360	.101	.228	.205	.332	.886	.530
.2598	.107	.242	.229	.364	.931	.566
.2650	.109	.255	.246	.391	1.024	.605
.3066	.138	.311	.314	.488	.984	.665
JAPAN (Hundred Billions of Yen)						
28.02	89.01	325.52	217.19	453.70	3.549	227.52
34.52	105.59	379.32	256.66	530.39	3.274	254.30
40.33	118.83	437.98	296.89	616.04	3.304	291.81
43.15	168.21	538.90	454.56	825.25	2.613	345.05
53.53	193.87	615.50	529.35	950.98	2.714	408.17
JORDAN (Billions of Dinars)						
.0246	.065	.094	.079	.108	. . .	.141
.0285	.062	.096	.079	.113	.340	.157
.0321	.072	.112	.092	.131	.433	.158
.0277	.102	.142	.121	.160	.271	.182
.0283	.116	.158	.136	.178	.239	.171
KOREA (Billions of Won)						
42.1	100.40	159.47	114.90	173.97	2.351	627.0
68.6	118.82	196.73	149.39	227.30	2.551	713.1
106.8	152.64	263.28	222.72	333.36	2.369	901.9
144.6	201.72	411.98	330.62	540.88	2.464	1069.9
209.3	259.20	648.63	514.74	904.17	2.787	1328.7
LIBYA (Billions of Libyan Pounds)						
.2337	.084	.112	.094	.122	.666	.271
.2992	.119	.155	.134	.169	.616	.384
.3704	.165	.212	.181	.229	.610	.479
.4310	.207	.261	.227	.281	.589	.574
.6797	.278	.351	.299	.372	.581	.798
MEXICO (Billions of Pesos)						
22.5	27.51	49.64	49.53	71.66	3.39	203.2
24.7	29.14	49.28	55.06	75.20	3.61	219.6
26.9	32.34	54.87	59.88	82.41	3.87	246.2
27.0	34.81	60.18	61.32	86.69	4.11	272.7
31.1	40.40	67.42	67.63	94.65	3.97	. . .

TABLE XXI--Continued

Year	Currency Outside Banks (1)	Demand Deposits (2)		Claims on Private Sector (3)	Personal Savings Deposits (4)	Bank Debits (5)
		Private	Government			
NETHERLANDS (Billions of Guilders)						
1964	7.17	8.25	0.66	8.15	6.19	11.15
1965	7.94	9.19	.39	9.62	6.75	11.56
1966	8.55	9.76	.33	10.70	7.44	13.12
1967	8.82	10.62	.78	13.21	9.67	14.34
1968	8.97	12.65	.39	15.61	11.31	16.27
NEW ZEALAND (Billions of New Zealand Dollars)						
1964	.1582	1.0202	.0356	.4840	.1252	1.5442
1965	.1608	.9501	.0284	.5481	.1377	1.6732
1966	.1600	.9918	.0352	.5818	.1518	1.7634
1967	.1532	.9513	.0357	.5879	.1611	1.8545
1968	.1545	.9145	.0324	.6625	.1738	2.0194
NICARAGUA (Billions of Cordobas)						
1964	.1854	.2749	.0570	.5595	.0791	.6165
1965	.1979	.3394	.0920	.7128	.1231	.7485
1966	.2272	.3379	.0709	.8856	.1734	.8322
1967	.2224	.3183	.0278	1.007	.2109	.9264
1968	.2086	.2990	.0406	1.102	.2312	.9864
NORWAY (Billions of Kroner)						
1964	4.67	8.60	2.75	17.25	15.00	2.68
1965	5.05	9.26	2.65	18.48	16.64	2.97
1966	5.42	10.03	2.55	20.54	18.09	3.14
1967	5.83	10.64	3.52	22.38	20.11	3.51
1968	6.14	12.95	3.00	24.34	22.24	3.67
PAKISTAN (Billions of Rupees)						
1964	5.025	3.343	.521	5.759	3.286	2.269
1965	5.498	3.578	.495	7.075	3.808	2.479
1966	6.098	4.420	.464	8.042	4.818	2.858
1967	5.843	4.282	.539	9.350	5.615	3.282
1968	6.499	4.592	.607	9.951	6.747	3.707
PHILIPPINES (Billions of Pesos)						
1964	1.325	1.549	.582	4.486	2.583	4.379
1965	1.483	1.584	.734	4.684	2.718	4.777
1966	1.543	1.828	.679	5.342	3.479	5.534
1967	1.756	2.027	.827	6.464	4.461	6.884
1968	1.777	2.204	0.797	7.009	5.197	8.805

TABLE XXI--Continued

Exports	M ₁	M ₂	M ₃	M ₄	V	National Income
	(1+2)	(1+2+3)	(1+2+4)	(1+2+3+4)	(5+2)	
NETHERLANDS (Billions of Guilders)						
28.125	16.08	24.23	22.27	30.42	1.251	51.079
30.934	17.52	27.14	24.27	33.89	1.206	56.949
32.843	18.64	29.34	26.08	36.78	1.300	61.568
34.730	20.22	33.43	29.89	43.10	1.257	67.560
39.060	22.01	37.62	33.32	48.93	1.247	74.000
NEW ZEALAND (Billions of New Zealand Dollars)						
.838	1.214	1.698	1.339	1.823	1.462	2.997
.832	1.139	1.687	1.277	1.825	1.709	3.230
.884	1.187	1.768	1.920	2.502	1.717	3.334
.856	1.140	1.728	1.301	1.889	1.878	3.459
1.108	1.101	1.763	1.275	1.937	21.32	3.697
NICARAGUA (Billions of Cordobas)						
1.106	.517	1.076	.596	1.155	1.857	3.330
1.177	.629	1.342	.752	1.465	1.735	3.571
1.167	.636	1.521	.809	1.695	2.035	3.722
1.244	.568	1.575	.779	1.786	2.676	4.027
1.316	.548	1.650	.779	1.881	2.904	4.219
NORWAY (Billions of Kroner)						
18.612	16.02	33.27	31.02	48.27	.236	34.805
20.367	16.96	35.44	33.60	52.08	.249	38.649
22.067	18.00	38.54	36.09	56.63	.249	41.804
24.839	19.99	42.37	40.10	62.48	.247	45.864
27.651	22.09	46.43	44.33	68.67	.230	49.319
PAKISTAN (Billions of Rupees)						
2.975	8.889	14.648	12.175	17.934	.587	42.459
3.158	9.571	16.646	13.379	20.454	.608	46.309
3.231	10.982	19.024	15.800	23.842	.585	54.148
3.230	10.664	20.014	16.279	25.629	.680	57.406
3.318	11.648	21.599	18.395	28.346	.713	63.054
PHILIPPINES (Billions of Pesos)						
3.073	3.456	7.942	6.039	10.525	2.054	16.506
3.691	3.801	8.485	6.519	11.203	2.060	17.794
4.546	4.050	9.392	7.529	12.871	2.207	19.562
4.697	4.610	11.074	9.071	15.535	2.412	21.499
4.449	4.778	11.787	9.975	16.984	2.934	23.575

TABLE XXI--Continued

Year	Currency Outside Banks (1)	Demand Deposits (2)		Claims on Private Sector (3)	Personal Savings Deposits (4)	Bank Debits (5)
		Private	Government			
PORTUGAL (Billions of Escudos)						
1964	17.52	46.30	2.48	54.62	13.95	12.13
1965	19.65	48.67	4.03	63.71	20.11	14.68
1966	19.85	52.81	5.19	71.18	23.58	16.38
1967	20.34	56.95	5.54	77.93	30.68	17.60
1968	19.27	63.88	4.83	89.94	38.31	20.52
SIERRA LEONE (Billions of Leones)						
1964	.0134	.0071	.0023	.0156	.0101	. . .
1965	.0141	.0062	.0005	.0152	.0109	.0253
1966	.0144	.0072	.0009	.0148	.0117	.0254
1967	.0143	.0070	.0021	.0149	.0117	.0266
1968	.0178	.0083	.0036	.0143	.0141	.0329
SOUTH AFRICA (Billions of Rand)						
1964	.303	1.125	.116	1.523	2.776	5.500
1965	.323	1.136	.065	2.121	3.357	5.879
1966	.356	1.244	.252	2.230	3.649	6.268
1967	.382	1.371	.243	2.515	3.914	7.148
1968	.404	1.649	.557	2.792	4.343	8.619
SPAIN (Hundred Billions of Pesetas)						
1964	1.317	2.520	.838	5.067	4.104	2.231
1965	1.511	2.939	1.086	6.393	4.927	2.786
1966	1.752	3.211	1.390	7.460	5.725	3.300
1967	1.989	3.694	1.697	8.765	6.722	3.631
1968	2.180	4.172	2.045	10.715	8.327	4.250
SWEDEN (Billions of Kronor)						
1964	8.50	8.84	. . .	24.55	50.99	52.93
1965	8.87	9.55	. . .	27.81	54.40	64.39
1966	9.49	10.71	. . .	30.50	59.21	90.85
1967	10.21	11.93	. . .	35.42	66.57	107.63
1968	10.74	13.66	. . .	40.68	74.44	98.92
SWITZERLAND (Billions of Francs)						
1964	10.33	18.01	.80	54.97	14.50	25.14
1965	10.71	18.72	.81	59.62	14.91	31.33
1966	11.37	19.17	.84	64.32	15.10	40.91
1967	12.09	20.71	.88	70.55	16.28	53.68
1968	13.03	23.85	0.87	78.65	18.96	76.61

TABLE XXI--Continued

Exports	M ₁	M ₂	M ₃	M ₄	V	National Income
	(1+2)	(1+2+3)	(1+2+4)	(1+2+3+4)	(5+2)	
PORTUGAL (Billions of Escudos)						
23.7	66.30	120.92	80.25	134.87	.248	84.6
27.7	72.35	136.06	93.00	156.17	.278	93.6
30.7	77.85	149.03	101.43	172.61	.282	101.9
34.5	82.83	160.76	113.51	191.44	.281	113.6
34.4	87.89	177.92	126.29	216.23	.298	123.5
SIERRA LEONE (Billions of Leones)						
.0741	.022	.038	.032	.048	. . .	.204
.0745	.020	.036	.031	.046	3.776	.214
.0684	.022	.037	.034	.049	3.135	.223
.0651	.023	.038	.035	.050	2.923	.232
.0942	.029	.044	.043	.058	2.764	.259
SOUTH AFRICA (Billions of Rand)						
1.977	1.544	3.067	4.320	5.843	4.431	6.066
2.010	1.524	3.645	4.881	7.002	4.895	6.630
2.141	1.852	4.082	5.501	7.731	4.189	7.213
2.319	1.996	4.511	5.910	8.425	4.428	7.989
2.545	2.610	5.402	6.953	9.745	3.907	8.510
SPAIN (Hundred Billions of Pesetas)						
1.285	4.675	9.742	8.779	13.846	.664	9.462
1.425	5.536	11.929	10.463	16.856	.692	11.782
1.739	6.353	13.813	12.078	19.538	.717	12.746
1.801	7.380	16.145	14.102	22.867	.673	14.008
2.325	8.397	19.112	16.724	27.439	.683	15.129
SWEDEN (Billions of Kronor)						
22.9	17.34	41.89	68.33	92.88	5.987	86.051
24.6	18.42	46.23	72.82	100.63	6.742	94.636
26.3	20.20	50.70	79.41	109.91	8.482	102.351
28.0	22.14	57.56	88.71	124.13	9.021	109.857
30.1	24.40	65.08	98.84	139.52	7.241	115.593
SWITZERLAND (Billions of Francs)						
15.930	29.14	84.11	43.64	98.61	1.336	46.570
18.100	30.24	89.86	45.15	104.77	1.604	50.145
19.890	31.38	95.70	46.48	110.80	2.044	54.015
21.275	33.68	104.23	49.96	120.51	2.486	57.500
24.060	37.75	116.40	56.71	135.36	3.099	61.670

TABLE XXI--Continued

Year	Currency Outside Banks (1)	Demand Deposits (2)		Claims on Private Sector (3)	Personal Savings Deposits (4)	Bank Debits (5)
		Private	Government			
THAILAND (Billions of Baht)						
1964	7.29	3.56	3.37	10.55	9.01	12.24
1965	8.18	4.48	4.55	12.61	10.08	14.30
1966	9.44	5.17	6.91	14.70	13.43	18.51
1967	9.91	5.61	7.16	17.04	16.33	22.85
1968	10.69	6.31	6.24	19.81	19.31	25.09
UNITED STATES (Billions of U. S. Dollars)						
1964	35.1	129.5	7.620	174.9	279.4	385.1
1965	37.2	135.9	6.468	201.1	311.7	427.9
1966	39.2	139.5	5.616	218.1	330.0	495.3
1967	41.3	150.6	6.723	234.5	371.8	556.6
1968	43.7	160.1	6.103	264.9	402.0	665.6
VENEZUELA (Billions of Bolivares)						
1964	1.430	2.822	.858	5.379	2.576	7.201
1965	1.570	3.065	.655	6.033	2.817	8.239
1966	1.679	3.163	.676	6.186	2.773	8.821
1967	1.816	3.674	.871	6.733	3.300	9.792
1968	1.983	3.924	.916	7.497	3.796	10.610
WEST GERMANY (Billions of Deutsche Mark)						
1964	27.8	39.5	67.9	199.6	102.5	161.3
1965	29.6	42.9	69.0	224.9	119.8	179.7
1966	30.8	43.0	75.1	244.3	139.7	198.7
1967	31.4	49.7	79.1	259.4	161.6	209.4
1968	32.6	55.4	100.5	335.2	196.2	254.0

TABLE XXI--Continued

Exports	M ₁	M ₂	M ₃	M ₄	V	National Income
	(1+2)	(1+2+3)	(1+2+4)	(1+2+3+4)	(5+2)	
THAILAND (Billions of Baht)						
13.69	14.22	24.77	23.23	33.78	1.766	62.83
15.09	17.21	29.82	27.29	39.90	1.583	67.97
18.83	21.52	36.22	34.95	49.65	1.532	80.79
20.66	22.68	39.72	39.01	56.05	1.789	86.43
. . .	23.24	43.05	42.55	62.36	1.999	. . .
UNITED STATES (Billions of U. S. Dollars)						
32.1	172.22	347.12	451.62	626.52	2.808	521.7
33.8	179.56	380.66	491.26	692.36	3.005	568.4
37.7	184.31	402.41	514.31	732.41	3.413	625.1
39.9	198.62	433.12	570.42	804.92	3.537	659.0
43.6	209.90	474.80	611.90	876.80	4.004	719.8
VENEZUELA (Billions of Bolivares)						
11.364	5.110	10.489	7.686	13.065	1.956	27.244
11.264	5.290	11.323	8.107	14.140	2.214	28.765
10.896	5.518	11.704	8.291	14.477	2.297	30.256
11.546	6.361	13.094	9.661	16.394	2.154	32.147
11.762	6.823	14.320	10.619	18.116	2.192	34.984
WEST GERMANY (Billions of Deutsche Mark)						
81.0	135.2	334.8	237.7	437.3	1.501	316.5
88.6	141.8	366.4	261.3	486.2	1.605	345.4
99.9	148.9	393.2	288.6	532.9	1.682	364.7
108.0	160.2	419.6	321.8	581.2	1.625	363.7
121.7	188.5	523.7	384.7	719.9	1.629	404.9

APPENDIX B

NOTES TO APPENDIX A

All figures were taken from International Financial Statistics, 1969, published yearly by the International Monetary Fund. Numbered items below refer to numbered columns in Table XXI, Appendix A.

Australia

1. Treasury coin issues are included with currency outside banks.
2. Includes private and government demand deposits at deposit money banks only.
3. Refers to domestic credit outstanding against the private sector.
4. Includes time and savings deposits at deposit money banks and savings banks.
5. The monthly average of bank debits to private sector accounts only.

Austria

1. Treasury currency issues are consolidated with currency outside banks.
2. Includes private sector demand deposits at deposit money banks and government deposits at the National Bank.

3. Refers to domestic credit outstanding against the private sector.

4. Includes time and savings deposits in deposit money banks only.

5. The monthly average of bank debits.

Bolivia

1. Treasury currency issues, if any, are not mentioned.

2. Refers to private sector demand deposits in the central bank, and in commercial and development banks. Government deposit figures were taken from those found in specialized banks and the central bank.

3. Domestic credit outstanding to the private sector.

4. Includes time and savings deposits at commercial banks only.

5. Refers to the monthly average of bank clearings.

Brazil

1. Refers to currency outside banks. Treasury currency issues are not mentioned.

2. Includes only demand deposits with the monetary authorities and at commercial banks. Government deposits were not listed separately.

3. Refers to domestic credit outstanding against the private sector.

4. Time deposits at commercial banks only.

5. Refers to the monthly average of bank clearings.

Canada

1. Includes treasury currency issues as well as currency outside banks.
2. Private sector and government demand deposits at commercial banks only.
3. Refers to domestic credit outstanding against the private sector.
4. Time deposits at commercial banks only.
5. The monthly average of bank clearings.

Ceylon

1. Treasury coin and currency issues are included with currency outside banks.
2. Includes private sector deposits at commercial banks only, and government deposits at the central bank and commercial banks.
3. Refers to domestic credit outstanding against the private sector.
4. Refers to time and savings deposits at commercial banks, Post Office deposits, and Ceylon Savings Bank deposits.
5. The monthly average of bank debits.

Chile

1. Currency outside banks only. Treasury currency issues are not listed.

2. Refers to private sector demand deposits at deposit money banks and government deposits at the central bank, as well as deposit money banks.

3. Domestic credit outstanding to the private sector.

4. Includes time and savings deposits at deposit money banks only.

5. The monthly average of bank debits.

Republic of China

1. Refers to currency outside banks. Treasury issues are not mentioned.

2. Includes private sector demand deposits at commercial banks, and government deposits at the Central Bank of China and commercial banks.

3. Refers to domestic credit outstanding against the private sector.

4. Includes time and foreign currency deposits of commercial banks, and time and savings deposits at the Central Bank of China and "other financial institutions."

5. Refers to the monthly average of bank clearings.

Colombia

1. Treasury currency issues are not mentioned. Refers only to currency outside banks.

2. Includes private sector demand deposits at commercial and development banks, and government demand deposits at the Bank of the Republic only.

3. Domestic credit outstanding against the private sector.
4. Refers to time and savings deposits at commercial and development banks.
5. The monthly average of bank clearings.

Costa Rica

1. Refers to currency outside banks only. Treasury currency issues, if any, are not listed.
2. Includes private sector demand deposits at commercial banks, and government deposits at central banks.
3. Refers to domestic credit less credit to government and official entities.
4. Time and savings deposits at commercial banks only.
5. The monthly average of bank clearings.

Denmark

1. Treasury coin and currency issues are included with currency outside banks.
2. Private sector demand deposits at commercial and savings banks and Post Office checking deposits, and government demand deposits at the National Bank.
3. Refers to the domestic credit outstanding against the private sector.
4. Refers only to time deposits at commercial and savings banks.
5. The monthly average of bank debits.

Dominican Republic

1. Treasury currency issues, if any, are not mentioned.
Includes only currency outside banks.
2. Refers to private sector and government demand deposits at commercial banks only.
3. Domestic credit outstanding against the private sector.
4. Includes time deposits at commercial banks only.
5. Refers to the monthly average of bank clearings.

Ecuador

1. Refers only to currency outside banks. Treasury issues, if included, are not listed.
2. Refers to government demand deposits at central banks only, and private sector demand deposits at central banks and development banks.
3. Domestic credit outstanding against the private sector.
4. Includes time and savings deposits at private banks only.
5. Refers to the monthly average of bank clearings.

El Salvador

1. Treasury currency issues are consolidated with currency outside banks.
2. Includes private sector demand deposits at deposit money banks and Central Reserve Bank, and government deposits at the Central Reserve Bank.

3. Refers to domestic credit outstanding against the private sector.
4. Time deposits at deposit money banks only.
5. The monthly average of bank debits

Finland

1. Treasury currency issues are consolidated with currency outside banks.
2. Refers to private sector demand deposits and unused overdrafts at Bank of Finland and deposit money banks. Also, includes government deposits at the Bank of Finland and deposit money banks, and government lending funds at savings banks and credit societies.
3. Domestic credit outstanding against the private sector.
4. Includes time and savings deposits at deposit money banks and consumer credit cooperatives.
5. Refers to the monthly average of bank clearings.

Greece

1. Treasury coin and currency issues are consolidated with currency outside banks.
2. Refers to private sector demand deposits at the Bank of Greece, commercial banks and development banks, and government demand deposits at the Bank of Greece only.
3. Domestic credit outstanding to the private sector.

4. Refers to restricted deposits at the Bank of Greece and savings deposits at commercial banks.

5. The monthly average of bank clearings.

Guatemala

1. Treasury currency issues, if included, are not mentioned. Refers only to currency outside banks.

2. Includes private sector demand deposits at deposit money banks and the Bank of Guatemala, and government deposits at the Bank of Guatemala.

3. Domestic credit outstanding against the private sector.

4. Refers to time deposits at deposit money banks, and time and savings deposits at development institutions.

5. The monthly average of bank clearings.

Honduras

1. Refers to currency outside banks. Treasury issues, if included, are not mentioned.

2. Includes private sector demand deposits at central banks and commercial banks, and government deposits at the central banks only.

3. Refers to domestic credit outstanding against the private sector.

4. Includes time, savings and foreign currency deposits at commercial banks.

5. The monthly average of bank clearings.

Iceland

1. Treasury currency issues are consolidated with currency outside banks.
2. Refers to private sector and government demand deposits at central banks and commercial banks.
3. Domestic credit outstanding to the private sector.
4. Refers to savings deposits at commercial and savings banks.
5. The monthly average of bank clearings.

India

1. Treasury currency issues are included with currency outside banks.
2. Refers to private sector demand deposits at commercial and cooperative banks, and government deposits at the Reserve Bank only.
3. Domestic credit outstanding to the private sector.
4. Refers to savings deposits at commercial and cooperative banks and Post Office savings deposits.
5. The monthly average of bank clearings.

Israel

1. Refers to currency outside banks. Treasury currency issues, if included, are not mentioned.
2. Refers to private sector demand deposits at deposit money banks, and government demand deposits at the Bank of Israel.

3. Domestic credit outstanding against the private sector.
4. Includes time deposits at deposit money banks only.
5. The monthly average of bank debits.

Italy

1. Treasury currency issues are included with currency outside banks.
2. Refers to private sector demand deposits at commercial and savings banks, and Post Office checking deposits. Government demand deposits were not listed separately.
3. Domestic credit outstanding against the private sector.
4. Refers to savings deposits at commercial and savings banks, and Post Office savings deposits.
5. The monthly average of bank clearings.

Jamaica

1. Treasury currency issues, if included, are not mentioned. Includes currency outside banks only.
2. Refers to private sector demand deposits at deposit money banks, and government demand deposits at deposit money banks and with the monetary authorities.
3. Domestic credit outstanding against the private sector.
4. Refers to time and savings deposits at deposit money banks only.
5. The monthly average of bank debits.

Japan

1. Treasury currency issues are consolidated with currency outside banks.
2. Refers to private sector demand deposits at deposit money banks, and government demand deposits with monetary authorities and "other financial institutions." Beginning in 1967, government demand deposits were also included at "specialized credit institutions."
3. Domestic credit outstanding against the private sector.
4. Refers to time deposits at deposit money banks, and time and savings deposits at "other financial institutions." Beginning in 1967, also included time and savings deposits at "specialized credit institutions."
5. The monthly average of bank debits.

Jordan

1. Treasury currency issues, if any, are not mentioned. Refers to currency outside banks only.
2. Includes private sector demand deposits at commercial banks, and government demand deposits at central banks and commercial banks.
3. Refers to domestic credit outstanding against the private sector.
4. Time and savings deposits at commercial banks only.
5. The monthly average of bank debits.

Korea

1. Treasury currency issues are included in currency outside banks.
2. Includes private sector demand deposits at deposit money banks only, and government demand deposits at the Bank of Korea in addition to government lending funds at deposit money banks and the Reconstruction Bank.
3. Refers to domestic credit outstanding against the private sector.
4. Time and savings deposits at deposit money banks only.
5. The monthly average of bank debits.

Libya

1. Treasury currency issues, if any, are not mentioned. Refers to currency outside banks only.
2. Refers to private sector and government demand deposits at commercial banks and the Bank of Libya.
3. Domestic credit outstanding against the private sector.
4. Includes time and savings deposits at commercial banks only.
5. The monthly average of bank debits.

Mexico

1. Treasury currency issues, if included, are not mentioned. Includes currency outside banks only.

2. Refers to private sector demand deposits at deposit money banks and savings banks. Government demand deposits are not listed separately.

3. Domestic credit outstanding against the private sector.

4. Includes time deposits at savings and deposit money banks and "other financial institutions."

5. The monthly average of bank debits.

Netherlands

1. Treasury currency issues are consolidated with currency outside banks.

2. Includes private sector demand deposits at commercial banks and "other money creating institutions," and government demand deposits at the Netherlands' Bank only.

3. Refers to domestic credit outstanding against the private sector.

4. Includes time and savings deposits at commercial banks, and time, savings, and foreign currency deposits at "other money creating institutions."

5. The monthly average of bank debits.

New Zealand

1. Treasury currency issues are consolidated with currency outside banks.

2. Refers to private sector demand deposits and unused overdrafts at Trading Banks, and government demand deposits at the Reserve Bank only.

3. Domestic credit outstanding against the private sector.

4. Includes time deposits at Trading Banks, Post Office deposits, Trustee Savings Bank deposits and Private Savings Bank deposits.

5. The monthly average of bank debits.

Nicaragua

1. Treasury currency issues, if any, are not mentioned. Includes only currency outside banks.

2. Refers to private sector demand deposits at commercial banks and government demand deposits at the Central Bank only.

3. Domestic credit outstanding against the private sector.

4. Includes time deposits at commercial banks only.

5. The monthly average of bank debits.

Norway

1. Treasury currency issues are included in currency outside banks.

2. Refers to private sector unused overdrafts and demand deposits at commercial and savings banks in addition to Post Office demand deposits. Also includes government demand deposits at the Bank of Norway and Post Office.

3. Domestic credit outstanding against the private sector.
4. Refers to time and foreign currency deposits in commercial and savings banks, and Post Office time deposits.
5. The monthly average of bank debits.

Pakistan

1. Treasury currency issues are consolidated with currency outside banks.
2. Refers to private sector demand deposits at Scheduled Banks and Cooperative Banks, and government demand deposits at Scheduled banks and the State Bank.
3. Domestic credit outstanding against the private sector.
4. Includes time deposits at Scheduled Banks, time and savings deposits at Cooperative Banks, and Post Office Savings deposits.
5. The monthly average of bank clearings.

Philippines

1. Treasury currency issues are consolidated with currency outside banks.
2. Includes private sector demand deposits at commercial banks plus unused overdrafts, and government deposits at central and commercial banks.
3. Domestic credit outstanding to private sector.
4. Refers to time and savings deposits at commercial banks, development banks, and savings banks.

5. The monthly average of bank debits to private sector accounts only.

Portugal

1. Treasury currency issues are consolidated with currency outside banks.

2. Includes private sector demand deposits at commercial and savings banks, and government deposits at the Bank of Portugal.

3. Domestic credit outstanding to the private sector.

4. Refers to time and savings deposits at commercial banks and savings banks.

5. The monthly average of bank clearings.

Sierra Leone

1. Treasury currency issues, if any, are not mentioned. Includes currency outside banks only.

2. Refers to private sector demand deposits at commercial banks, and government demand deposits in the Central Bank and commercial banks.

3. Domestic credit outstanding against the private sector.

4. Includes time and savings deposits of commercial banks, and Post Office Savings deposits.

5. The monthly average of bank debits.

South Africa

1. Treasury currency issues are consolidated with currency outside banks.
2. Includes private sector demand deposits at deposit money banks, and government demand deposits at the Reserve Bank and deposit money banks.
3. Domestic credit outstanding against the private sector.
4. Refers to time and savings deposits of building societies, building societies' shares, Post Office Savings Bank deposits, and time and savings deposits of deposit money banks.
5. The monthly average of bank debits.

Spain

1. Treasury currency issues are included with currency outside banks.
2. Includes private sector demand deposits at commercial and savings banks, and government demand deposits with monetary authorities in addition to government lending funds in credit institutions.
3. Refers to domestic credit outstanding against the private sector.
4. Includes time deposits, savings deposits, and foreign currency deposits at commercial and savings banks.
5. The monthly average of bank clearings.

Sweden

1. Treasury currency issues are included with currency outside banks.
2. Refers to private sector demand deposits at commercial banks and specialized credit institutions. Government demand deposits are not listed separately.
3. Domestic credit outstanding against the private sector.
4. Includes time deposits at Bank of Sweden, time and savings deposits at commercial banks, and savings deposits at savings banks.
5. The monthly average of bank clearings.

Switzerland

1. Treasury currency issues are consolidated with currency outside banks.
2. Refers to private sector demand deposits at deposit money banks and Post Office checking deposits, and government demand deposits at the National Bank.
3. Domestic credit outstanding against the private sector.
4. Includes time and savings deposits at deposit money banks only.
5. The monthly average of bank clearings.

Thailand

1. Treasury currency issues are consolidated with currency outside banks.

2. Includes private sector demand deposits at deposit money banks, and government deposits at the Bank of Thailand and deposit money banks.

3. Refers to domestic credit outstanding against the private sector.

4. Time and savings deposits of deposit money banks only.

5. The monthly average of bank debits.

United States

1. Refers to currency outside banks. Treasury issues are not listed.

2. Includes private sector demand deposits at commercial banks, and government demand deposits with the Federal Reserve Banks and commercial banks.

3. Domestic credit outstanding to the private sector.

4. Includes time deposits at commercial banks, and time and savings deposits at savings institutions.

5. Refers to the monthly average of bank debits.

Venezuela

1. Treasury currency issues are consolidated with currency outside banks.

2. Refers to private sector demand deposits at commercial banks, and government deposits at central banks and commercial banks.

3. Domestic credit outstanding to the private sector.

4. Includes time and foreign currency deposits of commercial banks, and time and savings deposits of Mortgage Banks.

5. The monthly average of bank clearings.

West Germany

1. Treasury currency issues, if any, are not mentioned.
Includes currency outside banks only.

2. Refers to private sector demand deposits at deposit money banks, and government deposits and government lending funds at deposit money banks.

3. Domestic credit outstanding against the private sector.

4. Time deposits at deposit money banks only.

5. The monthly average of bank debits.

APPENDIX C

TABLE XXII

NATIONAL INCOME ESTIMATES FOR DEVELOPED COUNTRIES USED
IN DERIVING THE ESTIMATING EQUATIONS, 1964-1968
(Billions of Local Currency Units)

Country	1964	1965	1966	1967	1968
Estimating Equations:					
1964:	$\text{LogNI} = 0.5652 + 0.9965\text{LogM}_3 + 0.0165\text{LogV}$				
1965:	$\text{LogNI} = 0.6085 + 0.9975\text{LogM}_3 + 0.0108\text{LogV}$				
1966:	$\text{LogNI} = 0.6195 + 0.9977\text{LogM}_3 + 0.0138\text{LogV}$				
1967:	$\text{LogNI} = 0.6741 + 0.9976\text{LogM}_3 + 0.0024\text{LogV}$				
1968:	$\text{LogNI} = 0.6496 + 0.9975\text{LogM}_3 + 0.0019\text{LogV}$				
Australia	16.90	17.97	19.44	20.81	21.68
Austria	174.25	190.65	210.16	213.22	227.46
Canada	28.96	31.95	34.38	37.00	41.03
Denmark	48.33	54.10	61.06	65.31	71.47
Finland	17.11	19.34	21.57	23.25	25.96
Italy	24146.64	26870.04	29685.84	30414.48	33359.61
Japan	22904.45	25429.44	28817.44	37024.28	42232.68
Netherlands	33.18	36.54	39.29	44.37	48.09
Norway	42.25	47.42	50.30	57.53	62.03
Sweden	102.25	107.21	118.36	121.82	131.71
Switzerland	62.76	65.85	68.42	71.38	78.73
United States	587.45	625.75	655.81	668.04	701.64
West Germany	312.06	340.57	373.43	393.25	456.09

TABLE XXIII

NATIONAL INCOME ESTIMATES FOR DEVELOPED COUNTRIES USED IN
DERIVING THE ESTIMATING EQUATIONS, 1964-1968,
WHERE EXPORTS WERE SUBSTITUTED FOR VELOCITY
(Billions of Local Currency Units)

Country	1964	1965	1966	1967	1968
Estimating Equations:					
1964:	$\text{LogNI} = 0.6160 + 0.8559\text{LogM}_3 + 0.1457\text{LogE}$				
1965:	$\text{LogNI} = 0.6547 + 0.8651\text{LogM}_3 + 0.1365\text{LogE}$				
1966:	$\text{LogNI} = 0.6666 + 0.8802\text{LogM}_3 + 0.1207\text{LogE}$				
1967:	$\text{LogNI} = 0.6741 + 0.8789\text{LogM}_3 + 0.1223\text{LogE}$				
1968:	$\text{LogNI} = 0.6633 + 0.9023\text{LogM}_3 + 0.0980\text{LogE}$				
Australia	14.94	16.10	17.65	18.91	20.09
Austria	176.08	193.81	209.86	219.26	232.54
Canada	28.18	31.51	34.08	37.83	41.72
Denmark	52.08	57.58	64.93	67.43	73.17
Finland	16.93	19.06	21.25	22.65	25.80
Italy	27199.00	29661.62	32628.49	32898.78	35509.67
Japan	22046.49	24799.38	28071.44	36032.58	41503.74
Netherlands	39.42	42.88	45.29	50.36	53.20
Norway	48.20	52.44	56.14	61.03	64.99
Sweden	94.54	101.08	109.97	117.84	127.74
Switzerland	61.97	65.49	68.19	71.39	78.56
United States	461.33	499.28	536.81	556.31	605.29
West Germany	318.99	345.64	379.58	400.64	459.78

TABLE XXIV

NATIONAL INCOME ESTIMATES FOR UNDERDEVELOPED COUNTRIES
USED IN DERIVING THE ESTIMATING
EQUATIONS, 1964-1968

Estimating Equations:					
1964:	$\text{LogNI} = 1.4750 + 1.0090\text{LogM}_1 + 0.1096\text{LogV}$				
1965:	$\text{LogNI} = 1.4566 + 1.0005\text{LogM}_1 + 0.1178\text{LogV}$				
1966:	$\text{LogNI} = 1.4340 + 1.0095\text{LogM}_1 + 0.1196\text{LogV}$				
1967:	$\text{LogNI} = 1.1722 + 0.6964\text{LogM}_4 + 0.1147\text{LogV}$				
1968:	$\text{LogNI} = 1.3935 + 1.0111\text{LogM}_1 + 0.1253\text{LogV}$				

TABLE XXIV--Continued

Country	1964	1965	1966	1967	1968
Bolivia	3.45	3.77	3.98	3.32	4.39
Brazil	20.51	33.31	43.41	21.51	82.71
Ceylon	8.35	8.71	8.49	7.77	9.73
Chile	9.20	13.74	19.57	16.28	. . .
China	86.31	96.18	114.51	50.64	162.54
Colombia	50.25	59.07	67.00	31.72	84.87
Costa Rica	3.42	3.64	3.84	5.89	4.87
Dominican Republic	.939	. . .	.962	1674.15	1.07
Ecuador	17.56	17.99	19.92	15.17	24.20
El Salvador	1.65	1.76	1.75	4.59	1.81
Greece	88.16	96.09	107.80	33.53	124.59
Guatemala	.759	.826	.890	2.88	.952
Honduras	.582	.650	.677	2.27	.816
Iceland	11.48	13.91	15.17	18.84	. . .
India	147.54	158.36	170.48	43.95	180.25
Israel	8.57	9.28	9.75	9.39	12.05
Jamaica	.478	.476	.488	1.94	.619
Jordan	. . .	.213	.252	.769	.317
Korea	448.42	541.88	688.73	136.83	1102.90
Libya	.373	.488	.632	1.34	.988
Mexico	148.72	162.87	188.69	59.88	. . .
New Zealand	5.93	5.86	6.02	5.66	5.82
Nicaragua	2.86	3.37	3.54	6.19	3.38
Pakistan	28.94	30.29	33.62	16.68	35.96
Philippines	17.81	19.54	21.25	19.51	26.10
Portugal	146.06	154.68	165.55	37.08	175.55
Sierra Leone	. . .	.177	.173	.916	.214
South Africa	10.68	11.21	12.79	17.17	16.40
Spain	1271.49	1456.24	1720.01	193.53	1992.65
Thailand	64.51	73.95	90.97	35.54	. . .
Venezuela	25.37	27.38	28.95	19.33	32.81

TABLE XXV

NATIONAL INCOME ESTIMATES FOR UNDERDEVELOPED COUNTRIES
 USED IN DERIVING THE ESTIMATING EQUATIONS, 1964-1968,
 WHERE EXPORTS WERE SUBSTITUTED FOR VELOCITY
 (Billions of Local Currency Units)

Country	1964	1965	1966	1967	1968
Estimating Equations:					
1964:	$\text{LogNI} = 1.5354 + 0.7025\text{LogM}_1 + 0.2917\text{LogE}$				
1965:	$\text{LogNI} = 1.5726 + 0.9551\text{LogM}_1 + 0.0430\text{LogE}$				
1966:	$\text{LogNI} = 1.5286 + 0.6682\text{LogM}_1 + 0.3265\text{LogE}$				
1967:	$\text{LogNI} = 1.6924 - 0.0380\text{LogM}_4 + 0.7316\text{LogE}$				
1968:	$\text{LogNI} = 1.4722 + 0.5862\text{LogM}_1 + 0.4111\text{LogE}$				
Bolivia	5.03	5.73	7.18	8.81	5.62
Brazil	16.76	36.98	34.16	15.07	48.99
Ceylon	8.53	8.73	8.65	8.11	8.65
Chile	7.41	10.78	16.31	16.06	23.32
China	84.34	81.52	118.54	56.75	178.91
Colombia	36.81	41.43	48.23	25.60	58.00
Costa Rica	3.12	3.11	3.59	5.95	4.72
Dominican Republic	.710	.827	.690	1508.81	.850
Ecuador	14.92	13.37	16.31	13.91	18.14
El Salvador	1.49	1.53	1.62	3.61	2.19
Greece	118.45	139.29	155.57	45.02	151.39
Guatemala	.603	.674	.721	1.99	.859
Honduras	.575	.605	.738	2.55	1.07
Iceland	18.04	16.40	23.85	21.58	. . .
India	118.58	157.68	135.83	33.15	. . .
Israel	8.94	9.38	10.07	10.44	15.67
Jamaica	.616	.580	.686	2.14	1.09
Jordan	.215	.347	.245	.437	.244
Korea	359.33	423.43	618.55	161.69	1071.16
Libya	.546	.677	1.02	3.08	1.27
Mexico	122.36	114.51	139.60	51.02	. . .
New Zealand	4.97	5.37	4.90	4.76	4.01
Nicaragua	3.09	4.56	3.67	6.25	4.21
Pakistan	28.92	38.64	32.21	11.47	29.12
Philippines	15.56	16.92	19.51	15.25	24.18
Portugal	224.03	261.06	254.90	59.45	233.03
Sierra Leone	.158	.134	.156	.830	.201
South Africa	7.82	7.24	9.01	9.34	14.12
Spain	1466.42	1745.07	1819.05	181.40	2128.55
Thailand	66.52	69.84	94.63	42.63	. . .
Venezuela	31.53	23.87	32.79	29.09	36.45

TABLE XXVI

NATIONAL INCOME ESTIMATES FOR DEVELOPED AND UNDERDEVELOPED
COUNTRIES USED IN DERIVING THE ESTIMATING
EQUATIONS, 1964-1968
(Billions of Local Currency Units)

Country	1964	1965	1966	1967	1968
Estimating Equations:					
1964:	$\text{LogNI} = 1.4791 + 0.9951\text{LogM}_1 + 0.0734\text{LogV}$				
1965:	$\text{LogNI} = 1.4606 + 0.9931\text{LogM}_1 + 0.0801\text{LogV}$				
1966:	$\text{LogNI} = 1.4543 + 0.9961\text{LogM}_1 + 0.0798\text{LogV}$				
1967:	$\text{LogNI} = 1.0335 + 0.8174\text{LogM}_4 + 0.0878\text{LogV}$				
1968:	$\text{LogNI} = 1.4212 + 0.9970\text{LogM}_1 + 0.0779\text{LogV}$				
Australia	20.42	20.68	21.98	27.72	24.41
Austria	215.93	238.09	257.70	195.92	265.75
Canada	48.53	55.97	60.10	52.20	68.31
Denmark	57.99	62.55	70.07	51.09	78.78
Finland	12.00	12.66	13.50	29.09	16.00
Italy	21116.59	23182.23	26948.70	3981.70	30651.10
Japan	23682.23	28094.32	32014.28	7637.55	43242.21
Netherlands	58.30	62.11	67.15	38.00	73.45
Norway	39.31	40.20	42.63	31.33	48.81
Sweden	90.12	101.21	116.83	133.00	123.86
Switzerland	101.85	110.13	121.63	91.67	150.00
United States	613.00	660.63	704.52	363.92	764.29
West Germany	424.51	452.16	483.28	236.17	556.48
Bolivia	3.68	4.08	4.55	3.40	5.03
Brazil	19.58	31.73	39.76	28.37	74.26
Ceylon	7.99	8.32	8.22	7.94	9.26
Chile	8.32	12.20	17.01	17.21	. . .
China	72.71	82.22	97.83	76.46	137.33
Colombia	42.06	49.08	54.92	40.13	69.57
Costa Rica	3.25	3.42	3.60	5.38	4.56
Dominican Republic	.912	. . .	.934	6512.27	1.03
Ecuador	15.61	15.61	17.33	16.34	20.90
El Salvador	1.60	1.70	1.68	3.73	1.73
Greece	85.85	94.54	107.38	57.10	127.57
Guatemala	.742	.800	.835	1.96	.846
Honduras	.600	.652	.681	1.63	.811
Iceland	11.21	13.54	14.62	23.84	. . .
India	129.92	140.95	151.26	70.00	162.14
Israel	8.33	8.88	9.26	10.64	11.67
Jamaica	.529	.516	.541	1.50	.676
Jordan	. . .	0.258	0.309	0.577	0.413

TABLE XXVI--Continued

Country	1964	1965	1966	1967	1968
Korea	359.40	434.07	539.69	252.08	848.26
Libya	.421	.545	.724	1.03	1.12
Mexico	120.19	131.18	147.24	84.22	. . .
New Zealand	5.72	5.57	5.75	5.13	5.44
Nicaragua	2.78	3.24	3.39	5.44	3.10
Pakistan	28.43	29.95	33.68	22.62	35.85
Philippines	16.10	17.60	18.93	22.79	22.44
Portugal	145.41	155.99	168.77	69.10	183.60
Sierra Leone	. . .	.175	.175	.504	.215
South Africa	9.24	9.53	10.87	17.80	13.85
Spain	1087.64	1268.92	1471.91	468.14	1760.66
Thailand	56.50	65.53	79.91	49.96	. . .
Venezuela	22.74	24.27	25.41	22.91	28.93

TABLE XXVII

NATIONAL INCOME ESTIMATES FOR DEVELOPED AND UNDERDEVELOPED COUNTRIES USED IN DERIVING THE ESTIMATING EQUATIONS, 1964-1968, WHERE EXPORTS WERE SUBSTITUTED FOR VELOCITY
(Billions of Local Currency Units)

Country	1964	1965	1966	1967	1968
Estimating Equations:					
1964:	$\text{LogNI} = 1.5101 + 0.7946\text{LogM}_1 + 0.1991\text{LogE}$				
1965:	$\text{LogNI} = 1.5493 + 0.9580\text{LogM}_1 + 0.0385\text{LogE}$				
1966:	$\text{LogNI} = 1.5254 + 0.7746\text{LogM}_1 + 0.2196\text{LogE}$				
1967:	$\text{LogNI} = 1.4896 + 0.2076\text{LogM}_4 + 0.6155\text{LogE}$				
1968:	$\text{LogNI} = 1.4689 + 0.7002\text{LogM}_1 + 0.2959\text{LogE}$				
Australia	16.57	17.28	17.86	16.33	18.71
Austria	195.28	188.01	219.99	170.33	240.40
Canada	38.09	40.88	47.17	44.66	56.83
Denmark	72.81	76.36	92.45	69.90	102.15
Finland	14.24	13.66	16.31	25.24	21.42
Italy	29614.30	30740.52	37437.73	8025.91	42460.13
Japan	20445.50	23014.83	26447.78	6001.20	35010.54
Netherlands	72.10	67.32	84.58	78.89	98.61
Norway	65.75	64.38	75.11	68.09	88.71
Sweden	72.90	69.76	85.00	82.60	97.08

TABLE XXVII--Continued

Country	1964	1965	1966	1967	1968
Switzerland	98.75	106.82	108.99	69.13	119.60
United States	425.14	527.69	448.59	142.23	431.11
West Germany	434.80	443.59	484.79	251.76	555.01
Bolivia	4.72	5.58	6.85	7.77	7.35
Barzil	17.11	34.65	34.35	20.93	56.24
Ceylon	7.97	8.42	8.36	8.31	9.01
Chile	7.00	10.35	14.98	17.56	23.81
China	69.39	75.00	99.90	85.99	142.63
Colombia	33.12	38.69	43.94	34.24	56.54
Costa Rica	2.98	3.07	3.41	5.52	4.57
Dominican Republic	.735	.839	.747	5943.52	.837
Ecuador	13.62	12.78	15.10	15.55	17.73
El Salvador	1.46	1.53	1.58	3.10	1.71
Greece	105.51	126.85	139.87	72.57	148.47
Gautemala	.617	.687	.717	1.47	.708
Honduras	.583	.617	.715	1.84	.902
Iceland	14.86	15.60	19.74	27.06	. . .
India	111.87	143.35	132.23	54.91	. . .
Israel	8.47	9.04	9.47	11.66	13.17
Jamaica	.621	.592	.680	1.63	.845
Jordan	.275	.359	.312	.341	.359
Korea	303.06	376.46	501.29	298.81	806.08
Libya	.538	.689	1.00	2.10	1.69
Mexico	102.01	104.62	119.58	75.90	. . .
New Zealand	5.02	5.24	5.04	4.48	4.77
Nicaragua	2.84	4.40	3.45	5.62	3.22
Pakistan	28.64	36.17	33.54	16.18	30.35
Philippines	14.38	17.09	17.83	18.79	18.82
Portugal	197.14	234.62	230.98	101.46	229.67
Sierra Leone	.161	.141	.162	.475	.220
South Africa	7.22	7.01	8.54	10.85	10.74
Spain	1197.82	1507.13	1556.62	439.37	1765.21
Thailand	56.35	64.48	82.19	59.51	. . .
Venezuela	25.47	22.52	27.34	33.41	32.05

TABLE XXVIII

TEST OF SIGNIFICANT DIFFERENCE IN POPULATION MULTIPLE
COEFFICIENTS OF CORRELATION, DEVELOPED COUNTRIES
IN RELATION TO UNDERDEVELOPED COUNTRIES
1964-1968

Year	r_1^*	r_2^{**}	Computed*** t-Value
1964	.988	.995	1.26
1965	.991	.996	1.43
1966	.991	.996	1.43
1967	.678	.996	6.80
1968	.989	.996	1.71

* r_1 = sample multiple coefficients of correlation, underdeveloped countries.

** r_2 = sample multiple coefficients of correlation, developed countries.

$$***t = \frac{z_1 - z_2}{\sigma_d} \text{ where,}$$

z_1 = transformed z-value computed from r_1 .

z_2 = transformed z-value computed from r_2 .

$$\sigma_d = \sqrt{(\sigma_1)^2 + (\sigma_2)^2}$$

$$\sigma_1 = \sqrt{\frac{1}{28}}$$

$$\sigma_2 = \sqrt{\frac{1}{10}}$$

TABLE XXIX

TEST OF SIGNIFICANT DIFFERENCE IN POPULATION MULTIPLE
COEFFICIENTS OF CORRELATION, DEVELOPED COUNTRIES
IN RELATION TO DEVELOPED AND UNDERDEVELOPED
COUNTRIES, 1964-1968

Year	r_1^*	r_2^{**}	Computed*** t-Values
1964	.995	.990	1.02
1965	.996	.992	1.29
1966	.996	.992	1.29
1967	.996	.782	6.32
1968	.996	.991	1.47

* r_1 = sample multiple coefficients of correlation, developed countries.

** r_2 = sample multiple coefficients of correlation, developed and underdeveloped countries.

$$***t = \frac{z_1 - z_2}{\sigma_d} \text{ where,}$$

z_1 = transformed z-value computed from r_1 .

z_2 = transformed z-value computed from r_2 .

$$\sigma_d = \sqrt{(\sigma_1)^2 + (\sigma_2)^2}$$

$$\sigma_1 = \sqrt{\frac{1}{10}}$$

$$\sigma_2 = \sqrt{\frac{1}{41}}$$

TABLE XXX

TEST OF SIGNIFICANT DIFFERENCE IN POPULATION MULTIPLE
COEFFICIENTS OF CORRELATION, UNDERDEVELOPED COUNTRIES
IN RELATION TO DEVELOPED AND UNDERDEVELOPED
COUNTRIES, 1964-1968

Year	r_1^*	r_2^{**}	Computed*** t-Values
1964	.988	.990	.39
1965	.991	.992	.26
1966	.991	.992	.26
1967	.678	.782	1.00
1968	.989	.991	.43

* r_1 = sample multiple coefficient of correlation, underdeveloped countries.

** r_2 = sample multiple coefficient of correlation, developed countries.

$$***t = \frac{z_1 - z_2}{\sigma_d} \quad \text{where,}$$

z_1 = transformed z-value computed from r_1 .

z_2 = transformed z-value computed from r_2 .

$$\sigma_d = \sqrt{(\sigma_1)^2 + (\sigma_2)^2}$$

$$\sigma_1 = \sqrt{\frac{1}{28}}$$

$$\sigma_2 = \sqrt{\frac{1}{41}}$$

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