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MONETARY AGGREGATION FOR A DEVELOPING ECONOMY: A CASE STUDY OF NIGERIA

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ABSTRACT

This paper examines the appropriate formulation of the monetary aggregate for the Nigerian economy for the period 1970:1-2000:4 for the determination of real output. This examination covers simple sum, Variable Elasticity of Substitution (VES) and Divisia (DV) aggregation over currency, demand deposits and savings deposits. The user cost of liquid assets is employed in the construction of both the DV and the VES aggregates. Since our variables proved to be I(1), the Johansen cointegration and error-correction modelling technique were used. Our findings for the Nigerian economy are that currency does as well as or better than any narrow- or broad-money measure in explaining industrial production. Further, the simple sum M1 and M2 outperformed both the VES and Divisia aggregates. Therefore, monetary policy in Nigeria should focus on the supply of currency and/or of narrow money, rather than on broad money or the Divisia aggregates.

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INTRODUCTION

Money plays a fundamental role in the economy, so that both its macroeconomic analysis and the pursuit of monetary policy presume a stable money demand function and a stable relationship between money and nominal national income. However, some definitions of money perform these roles better than others, so that the appropriate definition of money needs to be derived for each economy and re-examined periodically for any given economy. As the financial sector of an economy develops in the range of monetary assets and their close substitutes and the payments system innovates, the 'best' definition of money tends to change. As a consequence, in comparing the definitions of money for the financially developed economies and the financially undeveloped economies, it is quite likely that the most appropriate monetary aggregate would differ.

Since monetary theory itself does not provide a unique specification of what constitutes money, defined as the medium of payments, the literature has used empirical aggregation procedures to determine the inclusion of some assets and the exclusion of others from its favoured monetary aggregates. The three most common empirical procedures used for monetary aggregation have been the simple sum (sum), the variable elasticity of substitution (VES), and the superlative, especially the Divisia (DV), procedures.[1] A choice among them needs to be exercised[ii] since the inferences about the effects of money on economic activity depend on the choice of the monetary aggregate, as the literature on the developed economies abundantly shows. For example, in four of the five replications by Belongia (1996), the qualitative inference in the original studies was reversed when the sum aggregates were replaced by the Divisia ones. Consequently, the component variables and the econometric estimation of the monetary aggregates and their relationship with national income need to be carefully evaluated for the economy in question.

Table 1, based on Sriram (1999), presents the recent usage of the three types of the monetary aggregates in 38 studies that had employed cointegration techniques, separating them between those on the developed and developing economies. Out of the

Table 1: Monetary Aggregates Used in Selected Money Demand Studies in the 1990's

ECONOMIES	NUMBER OF STUDIES	STUDIES BY AGGREGATES		
		Sums (M1, M2, etc)	VES	Superlatives
Developed	13	12	-	1
Developing	25	24	-	1**
Total	38	36	-	2

**On Kenya – Adam (1992)
Source: Based on Sriram (1999).

total of 38 studies (13 for the developed and 25 for the developing economies), 36 employed sum aggregates, none used the VES aggregate, and only 2 used superlative indices (one for each of the developing and developed economies). Clearly, most money demand studies using cointegration techniques do not use either the VES aggregates or the Divisia ones.[2]

Further, on the choice among the monetary aggregates, while there is heated discussion in the literature on the developed economies, this debate is minimal in the literature on the developing ones. For example, the literature on the North American economies includes several studies that advocated and showed the relative merits of using the Divisia aggregates rather than the corresponding sum ones. Especially noteworthy in this regard are Barnett (1980, 1982), Barnett, Offenbacher, and Spindt (1984), and Belongia (1996), among others. On the developing economies, Adam's study (1992) on Kenya is the only study that constructed a Divisia aggregate. There is, therefore, clearly a need for additional studies on monetary aggregation in the context of developing economies.

The objective of this paper is to construct for Nigeria the sum, VES and Divisia monetary aggregates and to evaluate their performance. This paper contributes to the literature on monetary aggregation in at least two ways. It is the first of its kind to construct for any developing economy the three types of monetary aggregates, as well as test their relative performance.[3] Further, it constructs and evaluates the relative merits of the VES aggregate, which has not only been generally neglected in the literature on the developing economies.

The rest of the paper is organised as follows. Section II deals with the relevant part of the theory of aggregation. Further, this section identifies the 'price' of the services of the monetary assets by their user cost, and its implication for the estimation equation for the VES aggregation. Section III discusses the usage of the monetary assets in the Nigerian economy and specifies the data sources. Section IV derives the monetary aggregates, starting with currency in the hands of the public as the benchmark medium of payments, and evaluates their relative performance in explaining national income.

THE THEORY OF MONETARY AGGREGATION

The economic literature includes various definitions of money as the medium of payments. The choice among the commonly used definitions — usually allocated the symbols M1, M2, M3, M2A, etc. — depends upon the degree of substitutability of various monetary assets for currency and demand deposits. Since monetary theory does not provide a unique practical definition of money, various empirical criteria for establishing this definition have evolved over time. Among the best known is Friedman's criterion: the appropriate definition is that which 'best' explains nominal income. Using this criterion, Friedman found that the simple sum aggregate M2 – defined as the sum of currency in the hands of the public, demand deposits and savings deposits in banks – performed better than the simple sum aggregate M1 – defined as the sum of currency in the hands of the public and demand deposits in banks — for the United States data for the 1950s and 1960s. However, as financial deregulation was carried out and as innovations in the payments technology increased in the past three decades, both the relative performance of the simple sum aggregates in explaining nominal income and the stability of the money demand for these definitions became doubtful. The further quest for the best definition of money led to explorations in the theory of aggregation.

Assuming weak separability among a given set of monetary assets, monetary aggregation came to rely on three types of aggregates: the (simple or weighted) sum, the variable elasticity of substitution, and the Divisia ones. The following sections briefly review the nature and differences among these three aggregates.

Sum Aggregates

Both the simple and weighted sum aggregates assume perfect substitutability – that is, an infinite elasticity of substitution – among the included assets and zero substitutability between the included assets and the excluded ones. Given m monetary assets, which are weakly separable from all other goods, the sum monetary aggregate M is defined as:

$$M = \Sigma_j \; a_j X_j \qquad j = 1, 2, \ldots, m \tag{1}$$

where M is the nominal value of the monetary aggregate; X_j is the nominal value of the jth monetary asset; and a_j equals one for the included assets and zero for the excluded ones. Most studies set X_1 equal to M1. If this is done, (1) can be used to construct the broader sum aggregates such as M2, M3, etc., by including ever larger numbers of monetary assets, always with the implicit assumption that each additional asset is a perfect substitute for M1. This assumption becomes clearly so unrealistic at some point that further broadening of the monetary aggregate is stopped. However, it is also often not obvious that the assets *a priori* selected for inclusion in the broad monetary aggregates are really perfect substitutes for M1. Therefore, one needs an aggregation procedure that allows for a lower level of elasticity of substitution among the assets to be included in the monetary aggregate. The two convenient aggregation procedures that permit this are the Divisia and the Variable Elasticity of Substitution (VES) ones. We next specify the Divisia one, though, historically, the VES was proposed earlier for monetary aggregation.

The Divisia Monetary Quantity Index

Let X_{jt} be the quantity of the jth monetary asset and s_{jt} its relative share of the expenditure on the services of the monetary aggregate in period t. The discrete-time approximation to the continuous-time Divisia quantity index was specified by Barnett, Offenbacher, and Spindt (1984) as:

$$DVM_t = DVM_{t-1} \Pi_j \, (X_{jt}/X_{j,t-1}) \qquad j = 1, 2, \ldots, m \tag{2}$$

where DVM_t is the Divisia monetary aggregate/index for period t and s_{jt} (= $?_{jt}X_{jt}/\Sigma_j \, ?_{jt}X_{jt}$) is the relative share of component j during t and $?_{jt}$ is the ‘price’ of the monetary services of asset j during period t.[4] The logarithmic form of equation (2) is:

$$\log DVM_t - \log DVM_{t-1} = \Sigma_j \, s'_{jt} \, (\log X_{jt} - \log X_{j,t-1}) \tag{3}$$

where $s'_{jt} = \frac{1}{2}(s_{jt} + s_{j,t-1})$. (3) yields a chain-weighted measure. Assuming the relative share of each component in the total expenditure on monetary assets to be constant over time at s_j and dropping the period subscript t, in conformity with our equations for the sum and the VES aggregates, the Divisia aggregate becomes:

$$DVM = \Pi_j X_j \qquad j = 1, 2, \ldots, m \qquad (4)$$

In terms of the elasticities of substitution between the assets in each pair of the included assets, the Divisia aggregates with only unit elasticities of substitution are almost at the other extreme from the sum aggregates with infinite elasticities. This is quite a strong constraint on the partial elasticities of substitution, since the assets in certain pairs – e.g., currency and demand deposits – are likely to be very good substitutes for each other while the assets in other pairs – e.g., currency and savings deposits – could be very much poorer substitutes, especially in countries with inadequate banking facilities. Hence, from an empirical perspective, both the sum and the Divisia aggregates impose implausible restrictions and are unsatisfactory. Further, both these aggregates arbitrarily (*a priori*) specify the elasticity of substitution and do not permit its empirical measurement. VES aggregation has the advantage of allowing both the empirical determination of the elasticity of substitution and its variability among different pairs of assets.

The VES Monetary Index

The VES aggregation procedure proposed by Chetty (1969) is of the form:

$$VESM = \qquad j = 1, 2, \ldots, m \qquad (5)$$

where ρ_1 is set at ρ and ρ_j is the partial elasticity of substitution between the assets 1 and j. θ_j is the weight on asset j. VESM is in the nature of a preference function, which has to be maximized subject to the appropriate budget constraint. Leaving for later discussion the specification of the price θ_j of the monetary services of asset j, the budget constraint is $\Sigma_j \theta_j X_j = E$, where E is the total expenditure on the monetary services of the assets in the aggregate. As Chetty showed, the Euler equations for the VES function can be estimated in its stochastic form,

$$\log X_j = \alpha_{0j} + \alpha_{1j} \log(\theta_j/\theta_1) + \alpha_{2j} \log X_1 + \qquad j = 2, 3, .\theta., m \qquad (6)$$

where ? is white noise. (6) is the general form of the estimating equations for the VESM, with (m-1) estimating equations. The common element in all these equations is that X_1 is among the explanatory variables in each of these equations. Comparison of the Euler equations[5] for the VESM equation (5) with the estimating equation (6) yields $\alpha_{0j} = (-1/(\rho_j + 1))/\log(\beta_1 \rho/\beta_j \rho_j)$, $\alpha_{1j} = 1/(\rho_j + 1)$, $\alpha_{2j} = (\rho + 1)/(\rho_j + 1)$. The estimated value of α_{1j} can be used to calculate ρ_j, which along with the estimated value of α_{2j} provides the estimate of ρ. Then, normalizing by setting β_1 equal to unity, the calculated values of ρ and ρ_j along with the estimated value of α_{0j} are used to derive the estimate for β_j.[6]

Two problems with estimating equation (6) are worth mentioning. The first problem is that of simultaneity between X_1 and X_j since their amounts are determined simultaneously in the optimization process.[7] The second problem arises from the nonstationarity of the values of the assets considered for the monetary aggregates. Our ADF unit roots tests, reported later, showed that the data series of our three chosen monetary assets – currency, demand deposits and savings deposits - were I(1) in levels and I(0) in first differences. Therefore, the estimated coefficients using first differenced data are consistent and the usual standard errors and procedures of asymptotic inference are valid, so that the OLS procedure was used for estimating the Euler equations (6).

The Price θ_j of the Monetary Services of an Asset

The derivation of the Divisia and the VES aggregates requires specification of the 'price' θ_j to be associated with the asset j. Since the monetary assets are durable goods, their analogy with durable physical capital goods implies that only their services are used during each period, and the price θ_j of the services rendered during a period would be the rental or user cost, rather than the cost of purchasing the asset itself. Assuming the existence of a totally illiquid – that is, yielding zero monetary services – asset with the return R, the return foregone from holding a monetary asset j with the return r_j is $(R - r_j)$. Since $(R - r_j)$ occurs at the end of the period, its discounted value to the beginning of the period is $(R - r_j)/(1+R)$. In perfect markets and assuming the differences among the monetary assets to be only due to their degree of moneyness, $(R - r_j)/(1+R)$ is the user cost of the monetary services from asset j. Hence, as in Barnett (1980) for the case of a zero tax rate, our specification of the user cost θ_j of asset j for a given period is:

$$\theta_j = (R - r_j)/(1+R) \tag{7}$$

Therefore, for our earlier specification of the Divisia aggregate, the share s_j of the expenditure on the monetary services of asset j is given by $s_j = \theta_j X_j / \Sigma_j \theta_j X_j$.

Using the user cost specification (7) also ε for the VES aggregate,[8] our estimating equations for the VES aggregate become:

$$\log X_j = \alpha_{0j} + \alpha_{1j} \log [(R - r_j)/(1+R)] + \alpha_{2j} \log X_1 + \varepsilon \qquad j = 2, 3, \ldots, m. \tag{8}$$

THE NATURE OF THE NIGERIAN ECONOMY, ITS MONETARY VARIABLES AND DATA SOURCES

Nigeria, a West African country, with a population of 112 million, displays the characteristic of a dual and less developed economy. A modern segment heavily dependent on oil earnings overlays a traditional agricultural and trading economy. At independence in 1960, agriculture accounted for well over half of GDP and was the main source of export earnings and public revenues. Despite the considerable development of oil exports, agriculture (including livestock, forestry and fishing) still produces about 40% of GDP (EIU (2001)) and is still the principal economic activity of the majority of Nigerians. Currency plays the dominant role as the medium of payments over most of the country and most people do not have bank accounts or there are sufficiently high brokerage (including 'shoe leather') costs to prevent their use of even checking accounts as a common medium of payments. Therefore, for the Nigerian context, monetary aggregation has to start with currency C in the hands of the public as the principal medium of payments and then, using our three aggregation procedures, proceed to the construction of the monetary aggregates. This is done in the next section.

Our notation and data sources are as follows. We use C for currency; M1 for the sum of currency (C) and demand deposits (DD); and M2 for the sum of M1 and savings deposits in banks (SD). The corresponding VES aggregates are VESM1 and VESM2; and the Divisia ones are DVM1 and DVM2. We use the Index of Industrial Production as the proxy for real output y[9] and, because of data scarcity on the Producer Price Index, we use the Consumer Price Index (CPI) for the price level. To calculate user costs, we use the lending rate as the proxy for the return R on the illiquid asset, and, for want of better data, the deposit rate as the return on both DD and SD. Currency is assumed to have a zero return.

The data used is taken from the International Monetary Fund's International Financial Statistics (IFS) and is quarterly from 1970:1 to 2000:4. The Appendix Table 1 specifies the definitions of the variables and the specific lines of the IFS statistics for each series. Appendix Table 2 provides the data on the assets C, DD, SD and the monetary aggregates constructed from them.

THE MONETARY AGGREGATES FOR NIGERIA AND THEIR PERFORMANCE

Three types of monetary aggregates have been proposed in this paper. Of these, the construction of the sum aggregates for M1 and M2 is just the summation of the data on the component assets (C, DD and SD). The Divisia aggregates are constructed through weighted log-linear summation directly from the data on the component assets. Therefore, neither the sum nor the Divisia aggregates require estimation.

The Estimation of the VES Aggreate

The VES aggregates require econometric procedures for estimating the weight on each asset, as well as the elasticities of substitution between the pairs of assets. For this purpose, two equations, as specified by (8) above, need to be estimated for DD and SD as the dependent variable. Since our unit root tests showed C, DD and SD to be I(1), with their first differences as I(0), the two equations estimated for DD and SD are,[10]

$$\Delta\log(DD) = -1.37 \; - 5.56^{*}\Delta\log\,([R\text{-}r_D]/[1+R]) + 1.11^{*}\Delta\log(C) \qquad = 0.992$$
$$\quad (0.21) \;\; (0.82) \qquad\qquad\qquad\qquad (0.02) \qquad \text{D.W. stat. } 0.29 \qquad (9)$$

$$\Delta\log(SD) = \; 0.73 \; + 4.67^{*}\Delta\log\,([R\text{-}r_S]/[1+R]) + 0.932^{*}\Delta\log(C) \qquad = 0.993$$
$$\quad (0.21) \;\; (0.77) \qquad\qquad\qquad\qquad (0.02) \qquad \text{D.W. stat. } 0.32 \qquad (10)$$

The figures in the parentheses are standard errors and * indicates a significant coefficient at the 1% level. For the values of ρ_j and θ_j in the VES function (5), the estimated values from the DD equation (9) are $\rho_{DD} = -0.82$, $\rho = \rho_C = -0.80$ and $\beta_{DD} = 0.56$, while the estimated values from the SD equation (10) are $\rho_{SD} = -0.79$, $\rho = \rho_C = -0.80$ and $\beta_{SD} = 0.71$.[11] Based on these values, the estimates for VESM1 and VESM2 are:

$$VESM1 = [C^{0.80} + 0.56\, DD^{0.82}]^{1.25}$$

$$VESM2 = [C^{0.80} + 0.56\, DD^{0.82} + 0.71\, SD^{0.79}]^{1.25}$$

These estimates imply that, in the Nigerian context, the liquidity of demand deposits is approximately half of that of currency. Savings deposits have a somewhat higher liquidity than demand deposits, perhaps due to the fact that there are many Nigerians who maintain a savings, but not a checking, account, and use the withdrawals from the savings account directly into currency for payments against commodities.

Overview of the Monetary Aggregates

Table 2 allows a preliminary comparison of the monetary aggregates in terms of their growth rates. The average behaviour of these aggregates over the thirty years of the data suggests broad similarities that mask important differences. In particular, the reduction of the decimal points to two yields the same mean growth rate (0.06) for all the aggregates, except for DVM1 whose growth rate becomes 0.05. Since there is not much variation in the growth rates for the simple averages, we chose to also examine the growth rates for the median as an alternative measure of central tendency. The medians reveal clear variations among the growth rates of the alternative aggregates. These range from 0.04 for DVM1 to 0.06 for M1. This is further supported by two measures of dispersion: min/max and standard deviation. The min/max ranges from –0.13 for VESM2 to 0.4 for C. The standard deviation ranges from 0.06 for M2 to 0.09 for C.[12] Clearly, there are significant differences among the monetary aggregates, which necessitate a choice being made among them on the basis of some economic criterion or criteria.

Figures 1 to 5 provide plots of the growth rates of the monetary aggregates. Figure 1 shows that the fluctuations in M1 were greater than those in C during the 1970s but milder after the 1970s. While the turning points of M1 and C were at roughly the same times until the early 1980s, the turning points of C began to precede the turning points in M1 after the early 1980s.

Figures 2 and 3 compare the growth rates of M1 and M2 with those of their Divisia counterparts. In Figure 2, simple-sum M1 exhibits faster growth between 1975 and 1990 than the Divisia M1, with the two series moving almost identically in the late 1990s. In Figure 3, while M2 consistently maintains a fairly low and stable growth rate, DVM2 shows very large fluctuations in its growth rate.

Figures 4 and 5 compare the simple-sum and VES aggregates. The growth rates of M1 and VESM1 are very similar. Those of M2 and VESM2 are less similar, but still much more similar than of M2 and DVM2 in Figure 3. Therefore, we expect that the simple sum aggregates and the VES ones would have relatively similar levels of performance relative to the performance of the Divisia aggregates.

Table 2: Descriptive Statistics for Alternative Measures of Money Growth Rates, Nigeria: 1970:1 To 2000:4

DESCRIPTIVE STATISTICS	MONETARY AGGREGATES						
	C	M1	M2	VESM1	VESM2	DVM1	DVM2
Mean	0.056	0.058	0.059	0.058	0.059	0.046	0.058
Median	0.045	0.061	0.055	0.058	0.061	0.039	0.057
Maximum	0.379	0.378	0.273	0.382	0.278	0.263	0.317
Minimum	-0.300	-0.091	-0.074	-0.091	-0.069	-0.066	-0.060
Std. Dev.	0.090	0.079	0.057	0.077	0.056	0.062	0.067
Skewness	0.383	0.867	0.754	0.858	0.802	0.802	0.749
Kurtosis	5.514	4.723	4.802	4.761	5.026	3.832	4.156
Jarque-Bera	35.383	30.608	28.283	30.980	34.213	16.449	18.063
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Figure 1: Growth Rates of Currency and M1

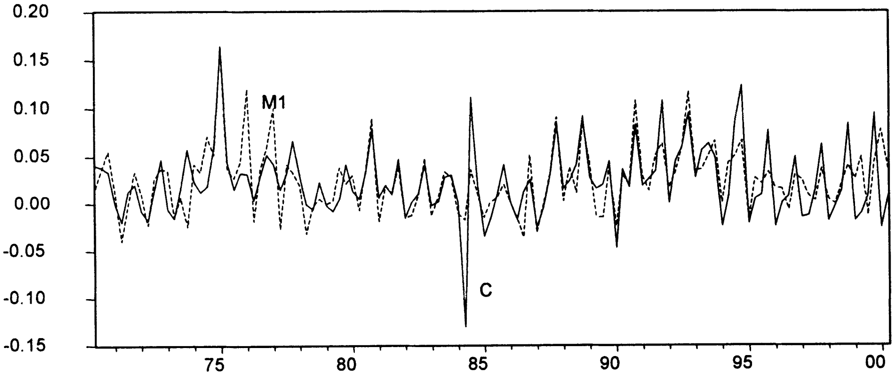


Figure 2: Growth Rates of M1 and DVM1

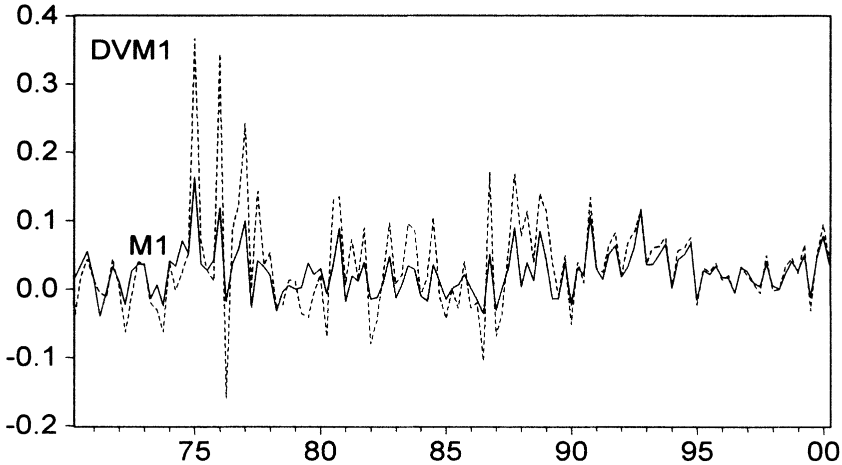


Figure 3: Growth Rates of M2 and DVM2

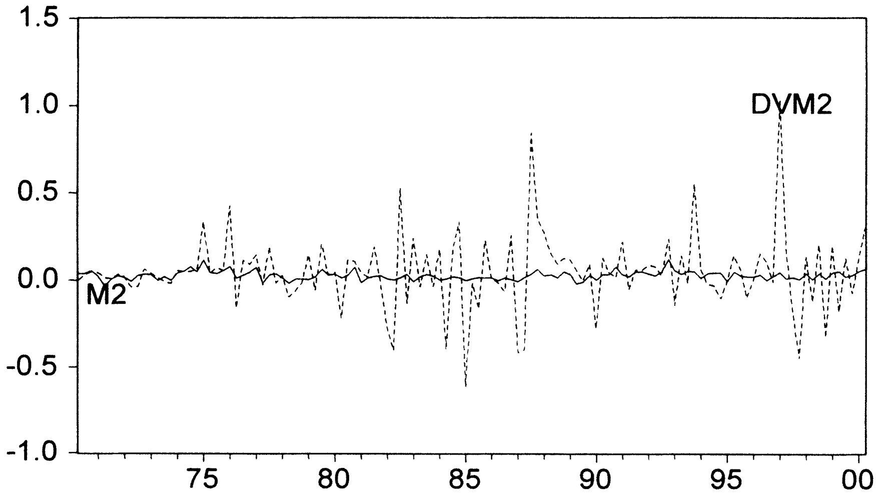


FIGURE 4: Growth Rates of M1 and VESM1

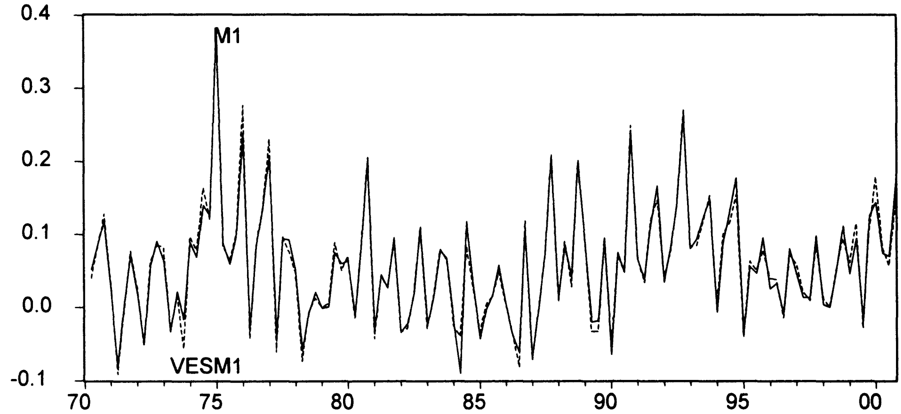
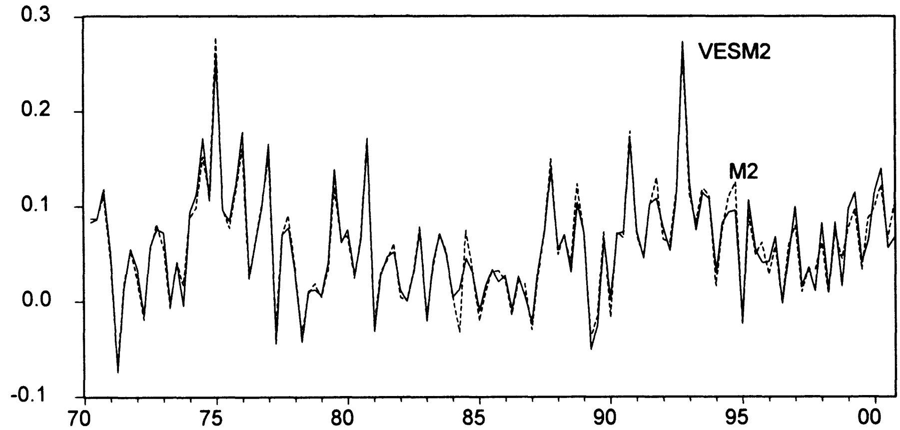


FIGURE 5: Growth Rates of M2 and VESM2



JUDGING AMONG THE MONETARY AGGREAGES

Several criteria[13] can be used for judging the relative performance of the monetary aggregates. Our choice among the monetary aggregates will be based on which monetary aggregate does ?best? in explaining national output y in a relationship of the form y = f(M, P, R) where y is real output, M is the nominal value of the monetary aggregate, R is the nominal rate of interest, and P is the price level.[14] Macroeconomic theory implies a long-run relationship among the four variables, though with the possibility of deviations from it in the short run. For a developing economy with imperfect financial markets, both the money supply and the interest rates can exert independent influences on aggregate demand and real output.[15] Further, with imperfect financial markets, the Fisher relationship between the nominal interest rate and the expected, let alone the actual, inflation rate is unlikely to hold, so that both the interest rate and the inflation rate can potentially affect output.

For M in the criterion function, we use our various monetary aggregates, starting with the public's currency holdings C as the benchmark measure of the medium of payments. This choice, rather than that of M1, which is common for economies with financially developed economies, is preferable for the Nigerian economy since payments in currency for the purchases of goods and services are normally the dominant mode of payment among most of its citizens and regions.

Unit Roots and the Order of Integration

Before estimating the long-run criterion function, the order of integration of each series was identified using the ADF t test with drift and trend. All the variables (including the constructed monetary aggregates) except for C proved to be I(1) while being stationary in first differences at the 5% significance level.., while C is stationary in first differences at the 10% significance level. Therefore, the appropriate estimation procedure for our criterion output function is the cointegration.

Cointegration and Error-Correction Results

The maximum likelihood procedure proposed by Johansen and Juselius (1990) and Johansen (1995) was employed for estimating the cointegration vectors and the accompanying error correction parameters. Our interest is to estimate a long-run relationship of a form:

$$\log y = \text{Constant} + \gamma^* t + \beta_1^* \log \text{MONEY} + \beta_2^* \log \text{CPI} + \beta_3^* \log R$$

where y is the Index of Industrial Production; t is the time trend and MONEY is alternately proxied by each of the seven monetary aggregates, which are C, M1, VESM1, DVM1, M2, VESM2 and DVM2. The βs are cointegrating vectors. Let $\mathbf{X}'$ = [log y, log MONEY, log CPI, log R]. The corresponding error correction model with a deterministic term D_t is:

$$\Delta X_t = \alpha\beta' X_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-1} + \Phi D_t + \varepsilon_t$$

The β vectors are the cointegrating vectors and $\beta'\mathbf{X}_t$ is the disequilibrium error. The coefficients α measure the adjustment to past equilibrium error. Our test procedure used the likelihood ratio test at the 5% significance level. Out of the seven equations, one for each monetary aggregate, six cointegrating equations consistent with the theoretical expectation of the signs were found. Their estimation results together with the error-correction feedback estimates (in brackets) are reported in Table 3.

Table 3: Normalized Cointegrating Equations and Error Feedback Results for the Various Aggregates

Variables	NORMALIZED COINTEGRATING VECTORS						
	(I) (using C)	(II) (using M1)	(III) (using VESM1)	(IV) (using DVM1)	(V) (using M2)	(VI) (using VESM2)	(VII) (using DVM2)
Y	1.00	1.00	1.00	1.00	1.00	1.00	Not significant
C	-0.9(-0.1)						
M1		-0.6(-0.1)					
VESM1			-0.6(-0.1)				
DVM1				-0.3(-0.1)			
M2					-0.8(-0.2)		
VESM2						-0.8(-0.2)	
DVM2							-0.7(-0.4)
CPI	1.6(-0.1)	1.5(-0.2)	1.5(-0.2)	1.6(-0.2)	1.6(-0.2)	1.6(-0.2)	3.6(-1.9)
R	-0.7(-0.2)	-0.8(-0.2)	-0.8(-0.2)	-0.1(-0.2)	-0.9(-0.2)	-0.9(-0.3)	-0.5(-0.6)
Trend	-0.04	-0.04	-0.05	-0.07	-0.04	-0.04	-0.1
Constant	4.9	4.01	4.00	-0.51	5.54	5.50	4.5

Note: DVM2 did not yield a significant cointegrating vector. The signs in the cointegrating vectors, other than for y, should be reversed for the coefficients of the explanatory variables. The amounts in the parentheses are the error correction parameters related to the respective variables. The variables are in logs. The reported co-integrating vectors were significant at the 5% level under the likelihood ratio test.

Note that the numbers reported in Table 3 are the coefficients of the normalized cointegrating equations and the signs of the coefficients of the explanatory variables have to be reversed for proper interpretation. All the cointegrating equations have the correctly signed coefficients: positive for the monetary aggregates and the long-term interest rate, and negative for inflation.

Table 3 yields two significant sets of findings for our data on the Nigerian economy. First, the results reject the neutrality of money, no matter which monetary aggregate is used. Second, the results do depend on the monetary aggregate employed. We next compare the relative performance of the monetary aggregates.

The values of the coefficients in the normalized cointegrating equations and the error feedback model are somewhat similar for the equations incorporating C, M1 and

VESM1 (columns (I) to (III) of Table 3).[16] In the determination of real output, the coefficient of C is 0.9, of M1 is 0.6 and of VESM1 is 0.6. These coefficients are correctly signed. In particular, the coefficient for C shows the long-run elasticity of output with respect to currency holdings to be 0.9, which may not be significantly different from unity.[17] The coefficient of DVM1 in column (IV) is an outlier at 0.3.

The error-correction coefficients (in brackets in Table 3) for currency and the narrow-money aggregates in columns marked (I) to (IV) are identical at 0.1, indicating a dynamic adjustment of 10% per quarter. In the equations with currency and narrow money, the coefficient of the inflation rate is about 1.6, with the short-run dynamic adjustment ranging from 10 to 20% per quarter.

Therefore, the cointegrating equations incorporating currency and the narrow-money aggregates reveal the respective long-run relationships and the short-run dynamic adjustment parameter between output and money, except when DVM1 is used as the monetary aggregate. We conclude that DVM1 did not perform as well as C, M1, and VESM1 for our data on Nigeria. This runs counter to the results usually derived for the developed economies, for which the Divisia aggregates usually do better than their sum counterparts.[18] While the VES index is extremely sensitive to estimation procedures and calculations of elasticities, it performed better for the narrow money aggregate than the Divisia one, with results somewhat similar to those for currency and M1.

The second group of cointegrating equations consists of the ones employing the broad money measures M2, VESM2 and DVM2, whose results are reported in columns marked (V) to (VII) of Table 3. In this group, using the likelihood ratio test, the equation with DVM2 did not yield a significant cointegrating vector. There is one significant cointegrating vector for each of the equations with M2 and VESM2, and their cointegrating coefficients (0.8) as well as adjustment speeds (20% per quarter) are similar. The coefficient of R and its dynamic adjustment parameter are also similar for VESM2 and M2. We conclude that VESM2 performs as well as M2.

Hence, for our Nigerian data set, we conclude that, no matter which monetary aggregate is used, money is not neutral. Another finding is that both the narrow and the broad Divisia aggregates (DVM1 and DVM2) do relatively poorly, compared with currency alone and also when compared with both the simple sum and the VES aggregates. Note that this finding on the VES aggregate is based on our innovation of replacing Chetty's specification of the present discounted cost of assets by their user cost, as specified in the literature on Divisia aggregation. Further, both the inflation rate and the interest rate have properly signed and plausible coefficients and dynamic adjustment parameters, especially for currency, M1 and M2, VESM1, and VESM2. We interpret this finding as indicating that the inflation rate and the interest rate have significant, independent effects on industrial production.

CONCLUSIONS

This paper has evaluated for the Nigerian economy the relative merits of sums, VES, and Divisia monetary aggregates in making inferences about the impact of monetary policy. It makes several contributions. At the general level, this paper resuscitates after an interval of several decades the construction of VES monetary aggregates but deviates from the original formulation by updating their construction on the basis of the user cost concept. It also derives estimates for the Divisia aggregates corresponding to M1 and M2.

The performance of the constructed series for the VES and Divisia aggregates in explaining industrial production is then compared with that of currency, M1 and M2. To do so, the relevant time series for unit roots are first tested for unit roots. Since the data series proved to be of integrated of order one, the Johansen cointegration and error-correction modelling procedures were employed at this stage. Our particular findings for the Nigerian economy are as follows. Currency does as well as or better than any narrow- or broad-money measure in explaining industrial production, which was used as our proxy for national income since quarterly data was not available on GDP. In our criterion equation for output determination, the VES aggregate for narrow money (VESM1) performed as well as C and M1. Moreover, the VES aggregate for broad money (VESM2) performed as well as M2. Both of the Divisia aggregates, DVM1 and DVM2, did relatively poorly. The use of DVM2 did not even yield a significant cointegrating relationship among the variables of the output function. Our plot of the growth rates of currency, M1, M2 and the constructed data on the simple sum, Divisia and VESM aggregates also showed the largest divergence of the growth rate for DVM2 from those for M2 and VESM2. The growth rates for M1 and VESM1 were also very similar relative to those of M1 and DVM1. These differences and similarities provide the explanation for the quite different performance in explaining output of DVM1 and DVM2 from those of the simple sum and VES aggregates.

These findings on the relative merits of the various monetary measures differ significantly from the general pattern of those for the financially developed economies. First, for the latter, currency holdings alone do not usually do well relative to both the narrow and the broader based monetary aggregates. For Nigeria, they did as well as or better than the latter. This is understandable given that the dominant medium of payments for most of the population in Nigeria is currency, while in the financially developed economies the medium of payments is at least M1, with savings deposits being a close substitute for demand deposits. Second, the narrow-money aggregates (M1, VESM1 and DVM1) performed better than the broad-money aggregates (M2, VESM2 and DVM2). This is also understandable in the context of an underdeveloped banking system. It can also be due to the much greater weight of currency — which is the medium of payments par excellence for most people in Nigeria — in the narrow-money aggregates than in the broad-money ones. Third, the Divisia aggregates did noticeably worse than currency and the simple sum and VES aggregates. The likely reason for this finding is that the Divisia aggregates *a priori* impose the constraint of unit elasticity of substitution between the pairs of our three monetary assets, which are currency, demand deposits and savings deposits. Among the segment of Nigeria's population, mostly in the major urban centres, which uses checking accounts on a regular basis, the elasticity of substitution between currency and checking deposits is likely to be very high, while it is likely to be closer to zero in the rural areas with limited banking facilities. While one cannot *a priori* predict the elasticity of substitution between currency and checking deposits in the aggregate data, a variable elasticity of substitution (VES) function should have a better likelihood of doing as well as or better than a Divisia one.

Finally, the VES monetary aggregates (VESM1 and VESM2) performed better than the Divisia versions. Their performance seems to have benefited from our extension to them of the user cost concept, usually associated with Divisia aggregation, as well as the employment of the cointegration and error correction modelling procedures.

Clearly, many of the above differences in our findings and those reported in the literature on the developed economies arise because our data is for a financially underdeveloped economy, which still uses currency as the dominant medium of payments. In general for financially underdeveloped economies, we conclude that currency is likely to be the dominant source of liquidity and changes in currency and the simple sum aggregates, especially M1, are likely to serve as better predictors of changes in national income than Divisia or VES aggregates. These make our findings of particular interest for financially underdeveloped economies. These findings also justify the general use in the literature of the simple sum aggregates for developing economies, as highlighted in Table 1 which shows that all but 1 out of 25 studies on developing economies had only used the simple sum aggregates.

An empirical reason for the relatively better performance of simple sum aggregates is that the interest rates in Nigeria were normally regulated and generally fixed at relatively low levels, often for several years. Further, in the absence of perfect financial markets, even their market-determined levels would not have reflected merely or adequately the cost of the liquidity services of the respective financial assets. This vitiates the underlying assumption of the user cost calculations for the Divisia aggregates. This assumption is that an asset's user cost based on the interest rate data reflects the cost of 'purchasing' the liquidity services of the asset. These problems with the interest rate data do not affect the simple sum aggregates which are not based on the user cost or interest rate calculations.

An additional reason for the relatively poorer performance of the Divisia is with the use of industrial production as our proxy for national output. Since the Nigerian economy still assigns a large weight to agricultural production, the use of real GDP for national output would have been preferable. However, the lack of quarterly data on real GDP and our use of the error-correction model led us to prefer quarterly data which was available on industrial output.

In spite of these potential data problems, we conclude that the findings for the financially developed economies on the relative merits of the Divisia aggregates vis-à-vis the simple sum aggregates need not extend to the financially underdeveloped economies. From the policy perspective, the monetary authorities in the latter need to rely more on changes in currency and in M1, rather than on M2, in their attempts to change aggregate demand in the economy. Further, their general failure to rely on Divisia monetary indices as policy guides or targets may well be justified for their particular economies.

The financially underdeveloped economies are noted for the existence of an informal financial sector.[19] This sector deals in 'loanable funds', for which illiquid bonds would be the primary example for the financially developed economies. Such funds/bonds are not a significant source of liquidity for payments purposes. Since their elasticity of substitution for the established media of payments (especially currency) is likely to be very low, we did not consider them to be relevant to the construction or performance of our monetary aggregates.

Our findings are subject to the usual caveat on the quality of the data. Though our data was taken from the IMF's *International Financial Statistics*, errors in the reporting and/or compilation of the data could have contaminated our results. In particular, the interest rate data, critical to the computation of the user costs and the expenditure shares of the various assets in the monetary aggregates, could be especially susceptible to errors. This can be checked by future studies on other financially underdeveloped economies.

ENDNOTES

[1] See Handa (2000, Ch. 8) for the procedures for constructing the different aggregates and their pros and cons.

[2] The rationale for this choice is the need to capture the monetary services used in the economy. Currency and in developed economies demand deposits clearly do so to a larger extent per unit than savings deposits and other monetary assets, which also provide another element – that is, a monetary rate of return. Just summing the individual assets does not provide a proper measure of the monetary services used in the economy.

[3] Sriram attributes the rationale for the choice of the sum aggregates to be data limitations and/or convenience.

[4] Even though Adams (1992) employed the Divisia aggregate in his money demand analysis for Kenya, he did not test its performance relative to that of the simple sum in explaining national income.

[4] A proper specification of the parameters of the user cost is needed for the calculation of the Divisia and VES indices. Its specification is discussed later in a separate section.

[5] The Euler equations are not reported here but are reported in Chetty (1969) and Handa (2000, Ch. 8).

[6] The method used for deriving the parameters of the VESM equation from the estimated values of the coefficients in equation (6) is as in Handa (2000, Ch. 8).

[7] This problem can be addressed by 2SLS: estimating this equation by replacing X_{1t} by $X_1'_t$ where $X_1'_t = ?_0 + ?_1 \log r_t + ?_2 \log Y_t + ?_t$, where r is the interest rate and Y is nominal GDP. The estimates obtained through this procedure would be consistent, and the asymptotic variance of the estimate can be calculated using the large sample distribution theory. However, in deriving $X_1'_t$, national expenditures and interest rates are unlikely to be exogenous with respect to the monetary assets, so that 2SLS may also be not consistent. Therefore, the OLS may be no worse than the 2-SLS as far as the inconsistency is concerned, so that we choose to proceed with OLS estimation.

[8] For this VES aggregate, Chetty (1969) had evaluated the cost of each asset as the cost of purchasing a unit of the asset at the end of the period. Chetty specified this cost for the jth asset as $1/(1 + r_j)$, where r_j is the interest paid on the jth asset. However, as the literature on Divisia aggregation stresses and as we discussed above, the appropriate cost for the monetary services of an asset during a period is its user cost, rather than its discounted purchase price. Therefore, in constructing our version of the VES aggregate, we replace Chetty's specification by the user cost $?_j$.

[9] Real GDP would have been a better approximation for y than industrial production, especially since this study considers the estimation of currency usage as important. The data on GDP was available only on an annual basis while that the Index of Industrial Production was available on a quarterly basis. Our estimation of the error-correction model (ECM) implied a preference for the use of quarterly over that of annual data. Given this preference and the unavailability of GDP on a quarterly basis, this study used the use of the Index of Industrial Production as the proxy for y.

[10] Comparing (9) and (10) with (5), $X_1 = C$, $X_2 = DD$ and $X_3 = SD$.

[11] The method used for the derivation of these estimated values has been specified earlier and is as in Handa (2000, Ch. 8).

[12] Skewness and kurtosis as well as the Jarque-Bera tests reveal non-normality of all the aggregates.

[13] Handa (2000, Ch. 8) lists five such criteria.

[14] In the error correction model, the log of the first difference of P is the inflation rate.

[15] Among the reasons for this is the importance of the credit channel in informal credit markets.

[16] The coefficients are quite different for DVM1.

[17] Alternatively, the elasticity of currency holdings with respect to output is 1.1, which could result from increased monetization of the economy as income rises.

[18] See, for example, Belongia (1996).

[19] Such economies also sometimes have black money, as well as black markets in goods. Without precise data on them, it is not possible to incorporate black money holdings into the construction of the monetary aggregates or in tests for their prediction of nominal income. Our guess is that any holdings of black money are likely to strengthen the case for currency as the dominant component of the medium of payments, and further reduce the elasticity of substitution between currency and various types of deposits.

APPENDIX

Table 1: Variable Definition and Data Sources

Variable	Source and Definition
INDPROD	Industrial Production (line 66). For Nigeria, this index would assign a dominant weight to the production of crude petroleum.
C	Currency in Circulation (line 14a) outside Deposit Money Banks.
DD	Demand Deposit (line 24) by the public (other than those of the central government).
SD	Time, Savings, and Foreign Currency Deposits (line 25).
M1	Money (line 34) equals the sum of currency outside Deposit Money Banks (line 14a) and demand deposits other than those of the central government (line 24).
M2	M1 plus time, savings, and foreign currency deposits (line 25).
r_D	Deposit Rate (line 60l) offered to resident customers for demand, time, or savings deposits.
r_L	Banks' Lending Rate (line 60p) to the private sector.
r_B	Treasury Bill Rate (line 60c).
R	Government Bond Yield (line 61*) on long term bonds.
CPI	Consumer Price Index (line 64).

Table 2: Adjusted Money Stocks Based on C, DD and SD

TIME	C	M1	M2	DVM1	DVM2	VESM1	VESM2
70:1	264.20	491.40	726.10	13.16	26.43	458.11	677.94
70:2	290.10	511.50	789.10	12.09	26.45	482.60	739.74
70:3	316.80	555.70	860.10	12.63	28.27	525.25	806.77
70:4	342.40	631.40	968.10	13.98	31.49	591.05	901.51
71:1	342.60	652.60	1018.50	14.44	34.55	606.79	940.88
71:2	327.60	595.70	945.40	14.26	35.62	559.04	878.19
71:3	338.10	592.20	957.30	13.86	36.16	560.23	892.52
71:4	354.50	639.80	1011.60	15.37	38.95	601.77	941.52

72:1	348.20	657.10	1046.80	15.56	40.53	612.25	965.84
72:2	333.90	623.70	1030.80	13.46	37.12	582.15	947.56
72:3	345.70	663.60	1093.00	13.14	34.08	616.08	1000.75
72:4	385.20	722.10	1179.00	14.40	39.25	674.36	1085.34
73:1	379.80	784.60	1267.30	15.72	42.80	718.05	1149.68
73:2	366.20	759.40	1263.60	15.00	44.00	694.18	1140.82
73:3	381.70	771.40	1316.70	13.97	43.14	709.22	1189.41
73:4	435.90	728.90	1310.90	12.11	41.18	697.51	1210.21
74:1	460.30	802.80	1439.90	13.21	46.51	762.07	1321.21
74:2	474.00	867.90	1610.10	13.16	51.78	815.96	1457.88
74:3	495.60	1022.30	1911.70	13.90	57.78	938.36	1697.79
74:4	569.80	1152.70	2125.60	15.70	66.12	1063.73	1897.79
75:1	832.50	1681.70	2753.80	36.62	142.53	1558.16	2506.65
75:2	921.70	1827.60	3030.80	43.00	155.91	1701.31	2762.25
75:3	956.30	1947.80	3297.50	45.80	183.47	1804.23	2983.31
75:4	1030.80	2155.20	3727.30	47.12	207.21	1987.54	3347.85
76:1	1109.00	2841.60	4455.30	104.20	554.88	2521.00	3932.28
76:2	1119.30	2723.10	4567.20	72.26	385.50	2440.24	4027.98
76:3	1199.20	2967.40	4870.80	88.33	498.03	2652.66	4298.21
76:4	1351.20	3400.80	5380.10	117.65	610.80	3034.55	4759.88
77:1	1489.20	4282.00	6351.20	205.91	847.74	3731.92	5547.60
77:2	1543.70	4026.70	6075.00	206.01	797.27	3574.69	5377.89
77:3	1665.60	4433.60	6513.80	286.67	1230.45	3924.78	5766.23
77:4	1940.80	4783.20	7038.40	310.79	1186.51	4303.43	6310.37
78:1	2079.90	5015.30	7241.30	351.63	1263.22	4534.42	6530.65
78:2	2075.40	4660.00	6941.40	332.40	1011.51	4270.14	6309.93
78:3	2045.90	4630.40	7020.80	314.80	880.44	4235.96	6359.26
78:4	2157.30	4687.10	7107.50	324.39	850.01	4323.67	6481.22
79:1	2147.40	4684.80	7151.20	333.35	1182.12	4317.97	6510.86
79:2	2108.20	4710.60	7456.30	307.14	1035.11	4321.24	6728.79
79:3	2136.10	5147.50	8566.00	278.80	1654.19	4655.94	7587.91
79:4	2350.80	5411.70	9113.80	274.98	1767.97	4942.48	8115.84
80:1	2425.40	5803.80	9825.80	288.74	1955.80	5264.19	8694.03
80:2	2455.70	5712.40	10098.20	245.71	1189.89	5209.48	8912.52
80:3	2656.60	6195.40	10783.00	331.99	1550.89	5652.31	9538.50
80:4	3185.90	7607.80	12771.00	453.63	1971.02	6924.91	11326.58
81:1	3234.60	7286.10	12375.10	460.23	2178.48	6705.19	11049.92

81:2	3387.70	7612.70	12731.10	544.23	2256.25	7012.44	11400.89
81:3	3464.30	7819.00	13346.10	561.34	3500.90	7198.42	11906.16
81:4	3861.90	8563.40	14057.60	691.11	3348.63	7918.99	12654.84
82:1	3727.60	8276.90	14227.90	574.73	1806.72	7649.17	12710.80
82:2	3743.90	8044.10	14230.20	517.50	717.62	7479.66	12712.84
82:3	3839.20	8196.50	14665.50	539.65	2409.05	7632.37	13088.90
82:4	4222.50	9160.00	15804.90	675.42	1766.40	8513.13	14162.74
83:1	4204.40	8896.40	15484.10	687.48	3059.65	8305.69	13905.01
83:2	4225.30	9055.10	16146.50	723.08	2794.15	8434.55	14413.80
83:3	4511.20	9799.50	17337.30	903.09	3911.54	9111.69	15469.66
83:4	4842.80	10463.10	18214.80	1101.35	3595.52	9745.74	16312.23
84:1	4856.10	10209.80	18303.20	1076.45	5379.17	9557.48	16372.34
84:2	3596.10	9808.70	18532.50	1116.16	2167.40	8728.59	15852.42
84:3	4646.00	10659.90	19380.10	1423.55	3209.46	9816.44	17081.99
84:4	4883.60	10934.10	19972.70	1396.30	6948.70	10119.48	17651.52
85:1	4511.90	10569.90	19776.80	1264.90	1708.70	9693.60	17296.66
85:2	4360.10	10618.20	20109.60	1266.43	1645.35	9665.87	17459.53
85:3	4464.20	10777.40	20794.70	1187.82	1128.08	9828.98	18019.19
85:4	4909.90	11306.20	21231.80	1304.22	1894.93	10411.25	18603.57
86:1	4927.30	11352.40	21815.30	1224.50	1923.23	10453.19	19037.34
86:2	4737.40	10962.50	21619.00	1171.59	1850.69	10081.72	18768.80
86:3	4880.10	10100.60	22201.50	920.15	1603.84	9482.84	19169.18
86:4	5177.90	11372.30	22314.60	1364.30	2891.86	10568.64	19526.38
87:1	4880.30	10586.10	21824.50	1164.60	1112.31	9853.99	18956.48
87:2	4833.60	10573.20	22586.40	1071.98	443.92	9825.91	19469.28
87:3	5191.30	11368.90	24359.70	1227.02	3095.59	10571.31	20983.50
87:4	6298.60	14006.90	27996.20	1808.71	7093.06	13015.72	24381.32
88:1	6539.30	14102.60	29550.10	2164.08	13300.26	13182.46	25612.77
88:2	6923.20	15428.00	31691.20	2817.08	18924.87	14345.85	27456.22
88:3	7622.90	15857.10	32683.50	3087.85	23334.19	14942.63	28550.63
88:4	9413.60	19295.80	36255.30	4265.46	30891.14	18270.38	32299.61
89:1	10029.50	21316.00	38948.50	5535.36	40297.77	20068.48	34711.45
89:2	10415.70	20623.50	37016.10	6075.96	45804.28	19666.55	33424.64
89:3	10924.00	19954.40	36101.10	5939.90	45594.67	19304.79	32916.14
89:4	12124.40	21862.20	38569.00	6651.81	56152.34	21217.30	35406.81
90:1	10886.70	20702.30	38638.80	5901.94	29685.40	19889.47	34824.60
90:2	11839.80	22252.70	41475.30	6461.07	39775.43	21439.29	37453.36
90:3	12345.40	23345.40	44617.20	6602.44	43636.53	22477.34	40060.47

90:4	14951.00	29951.00	52964.50	9014.30	45316.83	28607.36	47910.25
91:1	15636.30	32085.30	57009.30	9664.65	75026.03	30534.18	51357.45
91:2	16635.50	33185.80	59666.30	10226.82	66507.41	31754.03	53843.50
91:3	18023.60	37388.80	66107.80	11876.65	75933.01	35567.96	59536.17
91:4	23120.60	43300.10	73659.80	14383.96	86585.36	42007.87	67806.46
92:1	23161.50	45095.20	79636.30	15040.27	105066.70	43469.79	72391.69
92:2	25679.00	48714.70	84004.40	17621.19	124983.30	47208.30	77003.09
92:3	29504.50	55962.30	93678.90	21359.81	133030.80	54306.02	86391.59
92:4	36755.50	73322.10	123134.20	27773.05	228735.50	70725.19	112754.38
93:1	39172.50	79584.20	139298.60	30174.16	163569.30	76588.65	126247.14
93:2	44616.50	86553.70	150118.40	34660.04	226078.80	84027.52	137176.32
93:3	51650.50	97343.70	168215.60	40027.66	217009.40	95071.69	154461.51
93:4	57845.10	113436.90	187494.50	47664.75	775417.90	110223.68	172809.02
94:1	54731.90	113830.00	193120.30	47832.48	884053.20	109518.60	175675.92
94:2	55790.80	125806.30	209725.40	54549.29	836061.10	119515.41	189366.50
94:3	68182.90	141392.70	230381.80	62810.89	775007.30	136418.77	211409.23
94:4	90601.00	164998.50	253503.10	74840.19	607723.60	162861.49	239676.30
95:1	86364.40	158839.70	248501.00	70988.61	606079.30	156481.50	233777.91
95:2	87449.40	169208.40	276382.40	76208.82	835539.60	165441.52	256059.08
95:3	89467.80	177937.40	291541.40	80744.62	956524.90	173286.79	268963.88
95:4	106843.00	192406.60	303661.60	88251.19	761853.30	190521.44	286151.43
96:1	101106.00	200169.60	316616.60	90995.84	775264.00	195318.27	294388.84
96:2	101502.00	207844.00	338897.00	95335.00	1100641.00	201775.44	311845.24
96:3	103554.00	204827.00	338120.00	93904.03	1403821.00	199939.73	311824.24
96:4	116121.00	220138.00	354894.00	101322.40	1370033.00	216507.92	330802.25
97:1	112344.00	233664.00	392089.00	106244.50	14676898.00	226546.81	358130.66
97:2	109190.00	238610.00	398214.00	108309.90	21487719.00	229530.09	361743.95
97:3	113088.00	240692.00	412710.00	106728.30	14144407.00	232559.49	374237.79
97:4	130668.00	262555.00	417188.00	119714.60	5057852.00	256298.04	387096.96
98:1	125306.00	265708.00	453228.00	119093.60	6894918.00	257163.87	411720.63
98:2	124825.00	265834.00	458231.00	118962.20	5217293.00	257106.52	415156.09
98:3	129129.00	280126.00	498090.00	128323.50	8352457.00	270273.03	447443.34
98:4	156716.00	307692.00	506029.00	142750.00	3968655.00	301958.74	468001.80
99:1	150272.00	327173.00	557776.00	150546.20	6275271.00	316028.44	505305.03
99:2	146958.00	366946.00	625283.00	174948.80	4172205.00	347127.80	556789.69
99:3	149881.00	356516.00	651523.00	162667.80	5586490.00	339808.84	575731.97
99:4	186457.00	396356.00	695264.00	181836.40	4710307.00	385144.46	628480.35
00:1	175892.00	473982.00	781565.00	226413.50	6179752.00	444359.40	694137.06

00:2	179730.00	514581.00	899052.00	250228.00	12368256.00	478317.19	784403.04
00:3	204863.00	544763.00	951118.00	NA	NA	512729.10	837632.34
00:4	274011.00	630965.00	1017361.00	NA	NA	608642.24	927148.76

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