Currency:
Theory and Measurement in Village Economies

Youngjae Lim
Fellow, Korean Development Institute

and

Robert M. Townsend*
Department of Economics, University of Chicago
Population Research Center, NORC
Federal Reserve Bank of Chicago

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Abstract

Using crop production and transactions data from three villages in the semi-arid tropics of India, the paper succeeds in quantifying subject to measurement error much conjectured but rarely quantified monetary phenomena: the role of currency and other objects as stores of value and the role of commodities and currency as a media of exchange. Currency does play a role as a store of value within these villages, helping to bridge the gap between expenditures and revenues, particularly in monthly data for one village and in annual data for another. Credit, gifts, and financial assets play a salient role within two of the villages in monthly and annual data and crop inventory plays a role in all three in all data time intervals. There are salient patterns by land class, however, with poor and small landholders who tend to use currency relatively more than larger landholders who tend to use crop inventory. Surprisingly, purchases and sales of livestock and other real assets play little store of value role. In their interaction within the larger regional and national economies all three villages use crop inventory to smooth fluctuations. This is particularly striking in one of the three, but the roles of credit cum gifts and of currency is non-negligible in the other two. Finally, though much exchange within villages is monetized, credit and commodity barter account for as much as 20 to 30 percent of the value of all transactions, respectively.

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1. INTRODUCTION

Theories of money tend to engender controversy. The overlappings generation model of Samuelson (1958) has been argued by Wallace (1978), Sargent (1987), and many others to be a reasonable model of fiat money, of endogenously valued currency. The counter argument by Tobin (1980), and many others is that 25 year, generational holdings of currency are unreasonable a priori. Further, numerous other stores of value such as land that would drive a store of value role for currency to zero even in much shorter trading intervals.

What then of the role of currency as a medium of exchange? Authors Jevons (1875), and most recently Kiyotaki and Wright (1989), and Banerjee and Maskin (1996), have argued that commodity money emerges to economize on transaction costs of various kinds, given an absence of double coincidence of wants. But many others find these models stylized if not completely artificial. Do these models truly capture the real role of money? Why not, as in Lucas and Stokey (1987), start with the obvious and impose a Clower constraint, that is, that money be required in exchange against at least some subset of consumption goods.

Aiding and abetting in these controversies is an absence of measurement. We rarely get more than a glimpse of who is using currency, in what amount, and for what purpose.

There is a well known literature which does make a connection with this issue -- the permanent income literature. Most tests of the permanent income hypothesis use data on consumption and income only, but Zeldes (1989) uses data on asset holdings to test for liquidity constraints in the PSID. The obvious implication is that these assets are used to smooth consumption for those passing permanent income tests. Conversely, without assets in hand, Euler equations apply but as inequalities. More recently authors Paxson and Chaudhuri (1994), following the early lead of Walker, et al. (1990), have recognized the potential of data collected by The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) to shed light on the realism of such "buffer stock" models.

This paper follows the lead of this development literature and uses the production and transaction files from ICRISAT data to quantify, subject to measurement error, the role of currency as a store of value and the role of currency as a medium of exchange. Coming as it does from a real live economy, one can see the role of currency as a store of value relative to other assets, that is relative to stores of value which are readily available. Similarly, one can see the role of currency as a medium of exchange relative to alternatives: credit and commodity barter.

There are, of course, limitations in interpretation, that is, limitations in the ability to clarify the controversies. The ICRISAT villages of south India are small open economies - money could have value in the larger outside economy because of "transactions costs" in the larger outside economy, but we would not see this from the use of currency internally within the villages. Still, the distinction between within-village and cross-village exchange is reminiscent of so-called

turnpike models of money, e.g., Townsend (1980), and Manuelli and Sargent (1994). The point is that one can see from the ICRISAT data the role currency is playing as a buffer stock for each village in the aggregate, that is, see the role of currency as a store of value for each village relative to the larger national economy. If money were to play a large buffer stock role, we might infer that so-called turnpike models of exchange are on the right track.

We certainly are not the first to take existing theory to the ICRISAT data. Much work has been done already. Indeed, each of us has tried to fit a model economy to the ICRISAT annual consumption and income data. Townsend (1994) takes the full insurance (complete markets) model to the ICRISAT data and shows as a first approximation that household consumption is smoothed surprisingly well against income fluctuations. Still, the theory is rejected; idiosyncratic income matters for household consumption. Lim (1992) takes the permanent income model to the same data. Again, consumption is smoothed but not the way the permanent income model would predict. The permanent income model predicts that there should be as many factors driving consumption as there are factors driving income, but in the data there seems to be one rather large factor driving consumption with a set of smaller factors contributing to consumption variance. Ligon (1993) fits an information-constrained model to the ICRISAT annual consumption data and, compares it to both the full insurance and permanent income models. He finds evidence that the private information model fits the data best, but that model would predict that households are not in control of their own assets, indeed, are savings-constrained. In contrast, Paxson and Chaudhuri (1994) take a buffer stock model to monthly ICRISAT data, as noted above. There is a factor structure in seasonal consumption which is common across landholding classes, but there is not a common factor structure in income nor in real and financial assets. They conclude that currency and grain are the (unobserved) buffer stocks which smooth seasonal consumption. Related, Rosenzweig and Wolpin (1993) argue that self-insurance limits production, that ICRISAT households buy and sell assets (livestock and pumps) in good years and bad years, respectively.

With some exceptions then, there is not systematic examination of how the gap between income and consumption is actually filled. Our contribution here is to derive from the ICRISAT transactions and crop production schedules measures of the actual use of currency and crop inventory along with measures of gifts cum credit and of real assets. Our measurement is systematic in the sense that the entire (measured) gap between revenues and expenditures is accounted for with one, two, or various combinations of these categories.

Our goal in this paper is to understand existing theory better by measuring what really happens in exchange and in storage in an actual economy and by comparing and contrasting those measurements to what is supposed to happen in the model economies. In doing this we take a step toward understanding which model economy might fit some of the data best. Also, when there are anomalies in the data relative to existing theory, we are receiving guidance about how to improve

the theory, to construct new model economies. Here, however, we are intent on documenting salient features in actual economies with the hope that these might help remove some of the controversies outlined above

This paper proceeds as follows. In the next section we describe in detail exactly how we have accomplished the measurement of currency, inventory, and other items. In section 3 we go on to describe certain salient patterns by village, by landclass, and by whether we look at seasonal or annual data. In section 4 we construct tables of the frequency of use of all objects in exchange, noting the percent use of both barter and currency. Finally, we conclude in section 5 with a discussion of the use of money, credit, and crop inventory linking each village economy to the rest of the country.

2. FINANCING THE DEFICIT: MEASURING THE ROLE OF CURRENCY, CROP INVENTORY, CREDIT, AND REAL ASSETS

The ICRISAT data was gathered from 1975 to 1984 from three villages in southern India: Aurepalle in Andra Pradesh, and Shirapur and Kanzara in Maharahstra. Initially 40 households were selected in each of the three villages, ten in each landholding class: landless, small, medium, and larger farmers. Dropouts from the sample lowered the number of households in the sample for the entire ten years to 36, 37, and 35 households in Aurepalle, Shirapur, and Kanzara, respectively. The ICRISAT data which we use in this paper comes from either the transaction file or the plot file. The transactions file recorded in principle all market (and some intra-household) purchases, sales, gifts, credit, and other transactions with recall at about four week intervals. The plot file recorded the details of inputs and outputs of crop production on all of the plots operated by the sampled households, again with recall at about four week intervals.

Each entry in the transactions file consists of an account entry with two sides: the account into which cash flows in principle and the account out of which cash is spent in principle. These accounts are labeled: income and expenses from crop production, 0-9; income and expenses from animal husbandry, 10-19; production capital, 20-29; maintenance of production capital, 30-39; income and expenses from handicraft and trading, 40-49; income from labor; 50-59; credit, savings and gifts, 60-69; nondurable consumption expenditure, 70-79; and consumer durables and housing, 80-89. However, not all transactions actually use cash, and in any event, the quantities and values of goods on one or both sides of the transaction are recorded. The date of the interview is also recorded, with recall back to the previous interview. (Other information about transaction partners is recorded, but we ignore this at this point.)

The best way to understand the transaction file is to go through a series of actual example entries. These transactions are selected to be representative of transactions among households in all villages. We display first a table recording actual entries, Table 1, and describe each entry one

at a time. One should focus on money inflows or outflows. For this purpose we grouped transactions together.

Sale of Goods and Services

1. A household sold 36 kilograms of castor for money, 90 rupees. This is recorded as a *money inflow* into the 01 account, income from crop production (below we treat this as the sale from crop inventory), and the quantity and value are recorded. For this transaction there is no money outflow, and no numbers are recorded.

2. A male member of the household supplied 160 hours of labor and got paid 180 rupees, a *money inflow* into account 57, income from labor supply. There is no entry in the money outflow account.

3. A female laborer supplied 80 hours of labor and got paid in paddy (high yielding variety). The market value was 22 rupees. This barter transaction is recorded as a *money inflow* in the labor account, again account 57, and a money outflow from the consumption account 71, as if repurchasing rice.

4. Seven sheep were sold for cash, 70 rupees. This enters as a *money inflow* into account 21, (sale) of production capital.

Expenditures on Goods and Services

5. The purchase of kitchen utensils at 3 rupees is treated as a simple *money outflow* from the consumer durable account 81.

6. The purchase of fertilizer at 74 rupees is treated as a *money outflow* from production account 03.

7. A share rent was paid in pulses, 56 kg. This is treated as a *money inflow* from sale of pulses, 72.8 rupees in value, from the crop production account, and a corresponding *money outflow*, again 72.8 rupees from the production capital account 23.

Financial Transactions

8. A household borrowed 200 rupees in cash. This is recorded as a *money inflow* into account 62, financial assets - credit, savings, and gifts.

9. The household borrowed goods (medicines, cosmetics, soap, or barber services), 58 rupees in value. This is recorded as a *cash inflow* into the financial asset account 62 matched with a *cash outflow* into a category of nonfood consumption, account 73.

10. 240 rupees are withdrawn from a savings account. This is treated as the sale of a financial asset from account 61, with the rupees credited as a *cash inflow*.

11. When interest is paid in the amount of 500 rupees, this is treated as a *cash outflow* from financial account 63.

Intra-Household Transactions

12. The household used 7 kilograms of jowar-sorghum (local variety) as seed for crop production. The value recorded was 8.4 rupees. This is recorded as a sale from the crop income and expenses account 01, with a *cash inflow* of 8.4 rupees, and also an input into the crop income and expense account 02, with the same rupee value as a *cash outflow*.

13. The household milled 18 kilograms of jowar-sorghum (local variety), 18 rupees in value, for consumption. This is recorded as a sale of output from the crop income account 01 with the corresponding *cash inflow*, and also a purchase of consumption into the consumption account 71 with the corresponding *cash outflow*.

Barter Exchange in Consumption

14. The same household exchanged 7.7 kilogram of paddy (high yielding variety of rice) for 3.5 kilograms of spice (salt, tamarind, etc.). The imputed market value was 7 rupees. This transaction is recorded as a sale of paddy from the consumption account, 71, with a *money inflow* of 7 rupees, and quantity and value of rice is recorded. This is also recorded simultaneously as a purchase of spice into account 71, with a *money outflow* of 7 rupees, and the quantity and value of spice is also recorded. The sale of paddy would be from the crop income account 01 if paddy were not yet milled (see transaction number 1 above.)[1] but when paddy is milled, it enters the consumption account 71.

As is now evident, every market transaction can be distinguished as either a barter or a cash transaction. This is our first basic point about the transaction file. A cash transaction, i.e., pure sale, or pure purchase, enters into a cash inflow or cash outflow account, only. On the other hand, a barter transaction (or within-household transaction) is entered into both a cash inflow and a cash outflow account; the monetary values are equivalent, and indeed cash never changes hands. It is precisely from this evident distinction in the accounts that we are able to measure the actual use of currency in exchange (excluding within-household transactions). We shall discuss later common patterns of monetary and barter exchange.

At this point we need to digress to a technical matter. As in transaction #1, the sale of castor, income accrues in the transaction account only when the item is actually sold. In practice sale may come well after harvest, and so castor would be held in inventory in the interim. We are interested in this paper, however, not only in the use of currency but in the use of crop inventory (and other devices) to smooth income fluctuations, so we like to record systematically the date of

production, the use of crop inventory subsequent to that production, and of course eventually sale as recorded in the transaction file. To do this we turn to the crop production file. As noted, the crop production file records outputs on all operated plots, precisely the information we need. Thus we added the desired entries to a new transaction account. We treat the production output at the time it occurs as a money inflow into an unnumbered account as if immediately sold, adding to revenue, but also at the same time as a money outflow into another unnumbered account as if the crop were repurchased and placed into inventory. Table 2 displays an example of how one can treat recorded transactions in castor as going into or out of an inventory account.

Related, we are aware of alternative ways of treating crop expenses. For example, we could have taken the purchase of a crop input in the transaction file at the date of purchase and distinguished this from the date of its use in the production file. We could, in fact, create an input inventory category. We did not do this for several reasons. First, inputs which are crops or capital are already picked up in crop inventory accounts or dealt with in other ways (see below). This leaves inputs such as fertilizers, pesticides and herbicides, and we think these are of second-order importance in deficits and their finance. If we had made this change, we would then have to treat input expenses into livestock and into trade and handicrafts asymmetrically. The only information we have on these types of inputs is in the transaction file; there is no separate file for these occupations.

We now make a second point about these example transactions which brings us very much to the issue of financing the gap between revenue and expenditures. The point is that we can write down a transaction balance equation, and that every transaction enters this equation twice.

The transaction balance equation states that the difference in value between expenditures and revenue for some household i at date t, $p_{ct}C_{it} - p_{ct}Y_{it}$, must be financed by the sale of real capital assets $-\sum_{j=1}^{K} (K'_{ijt} - K_{ijt})p_{kjt}$; the sale of crop inventory, $-p_{ct}(S'_{it} - S_{it})$; the use of previously acquired cash, $-(M'_{it} - M_{it})$; or nominal borrowing plus gifts, $-(B'_{it} - B_{it})$. That is,

$$(1) \qquad p_{ct}C_{it} - p_{ct}Y_{it} = -\sum_{j=1}^{K} (K'_{ijt} - K_{ijt})p_{kjt} - p_{ct}(S'_{it} - S_{it}) - (M'_{it} - M_{it}) - (B'_{it} - B_{it})$$

To utilize equation (1) we need to categorize transactions. For example, the term $p_{ct}C_{it}$ for expenditures includes all nondurable consumption items including rent; all noncapital inputs into crop production, into trade and handicraft, and into livestock; all capital and durable good maintenance items; and similar noncapital expenditure items. The term $p_{ct}Y_{it}$ for revenue includes value of crops at the time of production (which again we treat as a sale to another household or to an inventory account), the value of trade and handicraft products sold, the earnings from wage labor, sale of products from livestock, and the sale of certain consumption goods (see above). Note the term $p_{ct}C_{it} - p_{ct}Y_{it}$ appears in the notation as the difference between consumption and

income, but in fact we use it more generally to mean the difference between revenues and expenditures of all kinds. For example, input expenditure might logically be subtracted from the value of crop output, but we treat it equally with consumption expenditures.

More specifically, the term $-\sum_{j=1}^{K} (K'_{ijt} - K_{ijt}) p_{kjt}$ is the sale of real capital, consisting of the sale of consumer durables, livestock, jewelry, land, farm equipment, buildings, and pumps. The term $-p_{ct}(S'_{it} - S_{it})$ is the sale of crop inventory. The term $-(B'_{it} - B_{it})$ is borrowing, reduction of savings accounts, incoming gifts, and receipt of stolen goods. Note finally that any of these sales or reductions can be negative, in which case they represent purchases, accumulation of assets, and so on.

We now come back to the point that every transaction enters the transaction balance equation (1) twice. In transaction number 1 above, the sale of goods represents both a reduction in crop inventory and an increase in cash holdings. That is, the transaction enters with a negative and a positive sign, and in the same amount, on the right-hand side of the transaction balance equation. This is a kind of portfolio shift. The labor supply transaction number 2 enters as a revenue on the left-hand side and an increase in cash holding on the right-hand side. The labor barter transaction number 3 represents both revenue and consumption expenditures, both on the left-hand side. Transaction number 4 is a reduction in capital assets and an increase in cash holdings, again a portfolio shift. Transaction number 5 is the purchase of a capital asset (consumer durable) with a reduction in cash balances, a portfolio shift. Transaction number 6 is an expenditure (on crop inputs) on the left accompanied by a reduction in cash on the right. The share rent in transaction number 7 represents both revenue (from the sale of crop as in transaction number 1), and an expenditure (for production capital), both on the left-hand side. The borrowing of money in transaction number 8 is a decrease in a financial asset matched with an increase in cash holdings, again a portfolio shift, but the barter-borrow transaction number 9 is a consumption expenditure on the left with an increase in net indebtedness on the right. In financial transaction number 10 the withdrawal from a savings account is a reduction in financial assets on the right is matched with an increase in cash balances, and in number 11 a reduction in cash reduces net indebtedness. The intrahousehold transactions number 12 and 13 both represent a reduction in crop inventory on the right-hand side matched with an expenditure (on either seed or consumption, respectively) on the left. Finally, barter transaction number 14 represents both a revenue and an expenditure on the left side of the transaction balance equation.

The transaction balance equation deals with observed, reported transactions as picked up in the transaction file, plus our modification for delayed sales. It does not track the changes, quality, or value of physical or financial assets between transactions, so to speak. For example, births of animals are conceptually identical with crops coming from seeds, and we might well have treated a

birth as a revenue when it occurs, accompanied with a corresponding increase in livestock holding. Deaths would be treated the same way with the opposite sign. Births and deaths are recorded in livestock file, but we have decided not to use these data. The effect would have been to make changes in revenue more frequent, matched with equivalent changes in real capital assets. Related, we could have tried to make adjustments for depreciation of capital assets as well as for capital gains. In this case, though, we do not have any direct measurement and would need to turn to educated guesses and/or to the stock inventory file (discussed momentarily).[2] Similarly, the incurring of a debt, or the adding of accrued interest, would be a kind of expenditure matched with an increase in net indebtedness, but we do not see these underlying commitments in the data.[3]

There is an asset or stock inventory file available in the ICRISAT data. Households were asked at the end of the crop year, approximately July 1, the amount of grain held in inventory, net indebtedness, the value of livestock holding, and so on. We have taken a close look at these data and compared them to data from the transaction file. For the reasons noted above, and perhaps for other reasons, the change in the value of these assets simply fails to track the annual deficit (or surplus) by the standards we report momentarily. This is true of all categories: changes in financial indebtedness, changes in crop inventory, and changes in livestock. We thus focus in the rest of this paper on the transaction file (with one exception below).

In the following section we exploit the fact that all transaction in the transaction file enter equation (1) twice to get an exact decomposition of budget deficits. That is, the accounts all balance, and there are no residual errors (which we could attribute to unmeasured use of currency or some other object). Thus one is left with the impression that all the numbers are exact and accurate, but this is obviously not the case.

To see this point, suppose that consumption is bought with money in the market and that the quantity of consumptions, C_{it}, and the decrease in cash holdings, $-(M'_{it} - M_{it})$, are measured with random errors as follows.

(2) $$C_{it} = C^*_{it} + \varepsilon_{it}$$

(3) $$-(M'_{it} - M_{it}) = -(M'_{it} - M_{it})^* + \upsilon_{it}$$

where C^*_{it} and the $-(M'_{it} - M_{it})^*$ denote the unmeasured true consumption quantity and the unmeasured true decrease in cash holdings, respectively, and where the ε_{it} and υ_{it} are random measurement errors.

Substituting (2) and (3) into (1) gives us

(4) $$p_{ct}C^*_{it} + p_{ct}\varepsilon_{it} - p_{ct}Y_{it} = -\sum_{j=1}^{K} (K'_{ijt} - K_{ijt})p_{kjt} - p_{ct}(S'_{it} - S_{it}) - (M'_{it} - M_{it})^* + \upsilon_{it} - (B'_{it} - B_{it})$$

Suppose, for example, a transaction (cash purchase of consumption) is under-reported in the data. Then, the associated measurement error in consumption, ε_{it}, is negative. This also means a reported decrease in cash holdings which is smaller than the true amount the error υ_{it} is also

negative. Indeed, the measurement errors, $p_{ct}\varepsilon_{it}$ and υ_{it}, are exactly the same. Therefore, equation (4), the measured version of equation (1), restores the accounting identity.

The same kind of reasoning can be applied to every transaction in the data. Every reported transaction enters equation (1) twice, so measurement errors cancel out. This is also the case for the un-reported transactions since they are extreme cases of the under-reported transactions. But over-, under-, and un-reported transactions should give one pause in taking all measured transactions in equation (1) as literally true.

Measurement error in the transaction file determines how accurate the entries in equation (1) actually are. For instance, one might ask whether people accurately recollect all previous transactions in monthly interviews. Concerning this, there is indirect evidence for the accuracy of recollections: people often report multiple transactions of the same type in each interview. In Aurepalle village, of the total 78,650 transactions reported, there are 9,622 cases with multiple entries of the same type in the same month. For instance, household number 50 in Aurepalle village reported the purchase of other spices (including sale, tamarind, etc.) seven times in June, 1976. The money values of those transactions were 10, 8, 5, 6, 2, 5, and 5 rupees, respectively.

One error of which we are aware is a drop off in measurement of certain consumption items, in the last three years of the ICRISAT data (see table in Townsend (1994)). Thus, expenditures are understated on average and, from looking at the graphs, we conjecture that currency accumulation is overstated. We thus drop the last three years from the analysis below. There are also concerns expressed by ICRISAT staff that the first year may also be less reliable in measuring consumption from own grain stocks, and so to be safe we drop the first year also. We are left with six years and 72 months of annual and monthly data, respectively.

We are not unaware of a second, peculiar feature of the ICRISAT consumption and income data, namely average annual income over all sampled households in any given village is about twice the size of average annual consumption. Perhaps consumption is under-reported, though in this case, using only six years of data, we do not know the source of the bias. Again, the accounts have to add up, and the apparent savings show up in *apparent* accumulation of currency, crop inventory, and/or financial assets. We note, however, that actual measurement may be more or less accurate. These ICRISAT villages experienced a drought in 1974, just before the survey began, and on the other hand, experienced a drought in 1987, and in 1988, after the survey ended. It is not inconceivable that the villages were replacing diminished stocks in anticipation of (expected) future disasters. More on this below.

A final issue has to do with time aggregation. Our starting point is the length of interview rounds. We cannot disaggregate any further than this recall period. We also note another source of error, however. Most interviews take place every four weeks, but not always. Figure 1 displays the relative frequency of the length of interview rounds, and it is apparent that some

households on occasion get interviewed earlier and some later. This makes so-called monthly data noisy; certain monthly patterns in actual transaction may be slightly obscured. This does not affect the financial decomposition, however.

In addition to presenting the "monthly" data, we present annual data which aggregates from July 1 to June 30, an ICRISAT crop year. These are the years of the consumption and income data which have been analyzed so closely in earlier work. Obviously, one of our interests is how the measured difference between annual consumption and income is actually financed. We also compare differences in financing in the monthly and annual data. For example, it might be thought a priori that cash would have a high velocity. That is, that cash received from sale of crops or other items would be used relatively quickly for purchases of other items. When aggregated over longer intervals, more and more transactions should "look like" barter transactions in that in the end cash balances remain unchanged. That is, annual data would not represent well the use of currency in transactions but rather the use of currency as a store of value, if currency shows up at all.

3. STORES OF VALUE: DECOMPOSING THE DEFICIT

We began our analysis by looking at time plots of the deficit, expenses minus revenues, against each of the four "financing" mechanisms: decrease in crop inventory, decreases in money holding, reductions in financial assets, and reduction in real capital holdings. We present patterns of each of the first three in Figures 2, 3, and 4, one household and one device at a time. We wanted a measure which would capture the extent to which any one, or any combination, of these mechanisms comes close to tracking the deficit numbers. Our preferred measure is a measure of relative mean squared error, and we present this first.

For purpose of exposition let d_t denote the deficit at various discrete dates t and let m_t denote the corresponding decrease in currency balances. We take our measure of "tracking" of cash balance reductions to be

$$\frac{\sum_{t=1}^{T} (d_t - m_t)^2 / T}{\sum_{t=1}^{T} (d_t)^2 / T}$$

where T is the number of observations. The numerator is the mean squared error in tracking, and the denominator scales the numerator by the total variation of the deficit, essentially the mean squared error when monetary changes are forced to be zero, as if money were not in the model or as if that particular smoothing mechanism were not available to the household. Our measure is obviously zero when monetary changes track the deficit perfectly, when the deficit is exactly matched with a decrease in currency, (m representing changes in inventory comes close to this standard in Figure 4, for example). Our measure is one when monetary changes are essentially

zero all the time (e.g., m representing changes in financial assets lies almost entirely on the x-axis in the first 24 months of Figure 2). If monetary changes amplify or overshoot the deficit, e.g., accumulating money in a bad year, then the numerator is larger than the denominator and our measure is greater than one minus, (e.g., when the deficit and the smoothing device lie on opposite sides of the x-axis as in month 2 of Figure 3).

This measure of tracking is close to a measure of $(1 - R^2)$, one minus explained variation relative to total variation, with these exceptions. First, we are not finding the "best fit" of a line through a scatter diagram. Second, and related, we care about levels, not just comovement, and so we do not subtract means from any of the variables.

We have also explored a more conventional measure of best fit, namely correlation coefficients. A correlation coefficient can be high if movements in m are a scaled down version of movement in d, even though m does not track d well in the sense that there is a gap between the lines of the graph in Figure 2, for example. Most of the results of our paper carry through with this alternative measure of smoothing, but our concern with levels leads us to focus in this draft on our relative mean squared error (RMSE) criterion.

A first issue to be settled is whether real capital assets, inclusive of livestock, help or hurt, in stabilizing the deficit, so to speak, with sales in months when expenditures exceed other sources of revenue. To do this we use our relative mean squared error criteria where the variable m is changes in livestock, or more generally, changes in real capital assets. To reveal some of the characteristics of the household-by-household distribution, we plot a Tukey or box and whiskers diagrams, revealing the median value among households, the upper and lower quartile values among households, and the maximum and minimum values of the household distribution. Those outliers in distance greater than or less than 150 percent of the width of the interquantile box are also reported. Indeed, extreme outliners can compress the scale of the graph, so sometimes these are suppressed. If they are, the graphs themselves indicate the cutoff value, on the y-axis. On each graph we plot separately each of the three villages.

Figure 5 and 6 are thus Tukey diagrams of livestock and real capital assets, respectively, using monthly data. As is evident, for all real assets, the RMSE criterion exceeds one for virtually all households. Thus asset transactions actually "destabilize" the deficit, with purchases in bad months, and sales in good months, for example. The same is true for livestock with the exception of the lowest quantile of households, and even for these households the RMSE criterion is still relatively high. Hereafter, in presenting the statistics for monthly data, we shift real asset purchases and livestock to the left-hand side of equation (1), as "contribution" to the deficit, e.g., purchases contribute to the deficit and sales to a surplus.

The measures of the tracking of the monthly deficit after real asset changes are presented in Tukey diagrams, village by village, in Figures 7, 8, and 9 for crop inventory, credit cum gifts, and

currency, respectively.[4] By far and away the most evident feature of the graphs is the extensive use of crop inventory as a smoothing device across all three villages. The interquantile range in Figure 7 lies entirely below unity for all three villages. This is not the case for credit cum gifts in Figure 8 nor for currency in Figure 9. Clearly crop inventory is a salient smoothing device, as Paxson and Chaudhuri (1994) suggest.

There are patterns by village, however, in the relative (and absolute) use of financing mechanisms. Figure 8 for credit shows that Aurepalle households use this device in larger numbers than in either of the other two villages, though Shirapur households did use this device. Indeed, credit does better in absolute terms in Aurepalle than does stock inventory. (Compare the distribution in Figure 8 with the distribution in Figure 7, with the exception of the highest quartile.) Figure 9 for currency shows that Kanzara households use this device in larger numbers than in either of the other two villages. In this case though, stock inventory does better in Kanzara in absolute terms. Compare the interquantile range in Figure 9 with Figure 7 The role of currency in Kanzara is consistent with the results of Paxson and Chaudhuri (1994), but the role of credit in Aurepalle and Shirapur is not.

Again, Figures 2, 3, and 4 present various time series graphs for various selected, individual households which fit these salient patterns: credit only in Aurepalle, currency only in Kanzara, and crop inventory only in Shirapur,. For each case we present one household which is at the lowest (best) quartile, that is, the graphs of 1/4 of the households in that village would appear even tighter, with better tracking. The reader can judge visually just how closely each device is tracking the deficit for RMSE numbers of .5429, .2850, and .1425, respectively. On occasion the fit is remarkable - e.g., inventory in Shirapur.

There are striking patterns by landclass for some smoothing devices, though the sample is small when stratified in this way. Recall there are roughly 10 households in each class, coded 0, 1, 2, 3, and for landless, small, medium, and large landholders, respectively. When restricting attention to inventory only, it seems to be the larger landholders rather the small or landless households who use crop inventory to smooth. See Figure 10. On the other hand, the landless are more prone to use currency, especially in Kanzara and Shirapur. See Figure 11. There seem to be no patterns as regards the use of credit, however, despite the fact that Townsend (1994) and Morduch (1990) have shown the poor to be less insured or to be credit constrained, respectively. Indeed landless and small landholders seem to use substantial amounts of credit and gifts in Aurepalle and Shirapur. See Figure 12.

One can also examine the effect of various combinations of mechanism. Of immediate note is that the sum of mechanism will almost inevitably do better than any one mechanism individually. Note in Figures 13 and 14 how the Tukey diagrams are below unity, whereas earlier portions were above, for example. Indeed, by construction, all three mechanisms track the deficit perfectly --

everybody would be piled up at zero! Having said this, we can compare across villages and note that money and inventory act well in combination with each other in Shirapur and Kanzara in Figure 13, but less so in Aurepalle where, as noted earlier, credit (the left out mechanism) plays a salient role. Related, credit and inventory play salient roles in Aurepalle and Shirapur in Figure 14, but less so in Kanzara where currency (the left out mechanism) plays a salient role.

Turning to the annual data we come again to the issue of whether livestock, or real capital assets in general, "stabilize" the deficit. They do not for three fourths of the households. We report in Figures 15 and 16 here from the transactions files, aggregating months into years, the Tukey diagrams for livestock and real capital assets, respectively. We report here as well the corresponding diagrams when we use the asset/inventory files. There is little improvement. (The figures for stock inventory and for financial assets from the asset/stock inventory files also show little smoothing - available on request.)

Otherwise the annual diagrams mirror what we learned earlier in the monthly data, with one exception. While Shirapur relies relatively more on stock inventory in Figure 17 and Aurepalle relies relatively more on financial credit cum gifts, in Figure 18, Kanzara does not rely relatively more on currency, in Figure 19, as if the velocity of money were relatively high. In fact Aurepalle, is the heaviest use of currency in the annual data, a significant smoothing device! Introspection about high turn over and a presumed high velocity of money would have led us astray. (Annual data reinforce though the relative roles of currency among the poor and stock inventory among the larger holders.)

4. TRANSACTION PATTERNS: BARTER VERSUS MONETARY EXCHANGE

We have done some preliminary work to try to see if these village economies are heavily monetized in transactions or whether there is still a role for barter exchange. To do so, we have disaggregated the categories of commodities further: money, IOU's, grain, other crops, food other than crops, clothing, other consumption goods, labor, livestock, physical real assets, jewelry, consumer durables, and a residual other category. We restricted attention to monthly data with the idea, of course, that we care about the objects used in each and every transaction -- we do not want to aggregate. Also, we are using the measured data from the transaction file and not our addition from the production file. We also exclude measured intra-household transactions, that is, we are looking at "market" transactions only. However, we do add up here over all transactions of all sampled households in all of the six years. (Individual tables are available on request.)

Table 3, a, b, c, present exchange patterns of each commodity against every other commodity, including the same commodity aggregate. The entries are expressed as a percent of the rupee value of all transactions of the village. For the record, the total rupee value in Tables 3 is 2,566,369 in Aurepalle, 4,150,772 in Shirapur, and 3,319,781 in Kanzara. Most evident in Tables 3 is the relatively high percent of transactions by value in which currency appear in

exchange. The first row is currency spent to purchase something, including the purchase of IOU's (lending), and the first column is currency received from selling something, including the sale of IOU's (borrowing). We note that in Aurepalle the rupee value of all cash purchases, including lending, is 37 percent of the total, whereas in Shirapur and Kanzara it is 45 and 46 percent, respectively. Thus Aurepalle is less monetarized than the other two villages. Cash sales are 43, 46, and 45 percent in Aurepalle, Shirapur, and Kanzara, respectively, a less striking difference. That currency appears so frequently in exchange would suggest something special about currency, that it dominates other commodities in exchange characteristics or, more crudely, that it facilitates exchange in the sense of Clower.

The second row and second column of Table 3 are each filled with nonzero entries, in most cases, indicating the importance of borrowing and lending (with gifts) in the three village economies, roughly 9 - 14 percent for borrowing and 7 - 13 percent for lending. By this standard it would seem to be inappropriate to view these village economies as rigid cash-in-advance economies. Most expenditures, including consumption expenditures, can be and are often financed with credit. Though we provide no table here, this is true as well when attention is restricted to landless households even though, as noted earlier, currency may play a relatively large role in smoothing monthly (and annual) fluctuations for them. Finally, we note the relatively large role of grain loans in Aurepalle, the less monetized village economy where the role of credit was noted earlier.

There are some relatively large entries other than in the first two rows and columns of Table 3. One of these is sale of labor for grain and to a lesser extent, for other crops and for other consumption items. The other side of this transaction is grain sold for labor. Obviously, landless laborers and many small farmers are on average providing labor to medium and larger landed households for grain. This is confirmed when we distinguished the tables by landclass, but again we do not display these. Another nontrivial entry in Aurepalle, but not the other two villages, is the exchange of jewelry for other consumption goods. Such entries display the common types of barter exchange. We would have to say that the village economies are mixed economies, displaying both monetary and barter exchange.

There are some nonzero entries on the diagonals of Table 3 of some interest. One is labor for labor; another is livestock for livestock. We strongly suspect these are exchange transactions in which households take turns helping each other out in crop operations, requiring labor or plow animals. (We do not interpret grain for grain.)

Another closely related view of transactions is presented in Table 4, a, b, c -- a simple count of the number of transactions, not aggregated in value terms. We note, for example, by this new standard that the relative importance of credit drops somewhat; less than 5 percent for borrowing and less than 5 percent for lending in all three villages. Obviously, credit transactions

are lumpy, that is, they tend to be large by value when they occur. Apparently, there are "transactions costs" even within these village economies in the use of credit. We wonder what these are.

Finally, we would like to take these transactions data further and trace out typical transactions as in the models of Jevons (1875), Kiyotaki and Wright (1989), and Banerjee and Maskin (1996), for example, that is, with something purchased from one person and then used later in a sale to another. The evident problem with this is that virtually all objects can be and often are held in inventory simultaneously, over many periods, so it is difficult to identify the original source of the object used in exchange. Further, there is some consumption between exchanges. Finally, currency and commodity barter coexist. The bottom line is that the simple (but not easy to analyze) models of exchange in the literature are contradicted by salient facts. Currency, in particular, is both a store of value and a medium of exchange.

5. SPATIAL PATTERNS: MICRO FOUNDATIONS FOR MACRO MODELS

We are not unaware that the essence of monetary theory is to deliver valued money in an otherwise closed economy. What is it in the economy as a whole that gives rise to fiat currency, for example? Needless to say, these ICRISAT village economies are not closed economies. They may be using currency to facilitate transactions and store value because currency is valued in the larger national economy of India. Viewed in this way, transactions within a village cannot shed sufficient light on the essential impediment to trade which gives rise to valued money in the larger national economy.

Nevertheless, the relationship of these village economies to the larger national economy is not without interest to monetary theorists. We might view the village as solving its own optimum problem among various diverse households, perhaps approaching something resembling a within-village Pareto optimum. This is the case in the model of Manuelli and Sargent (1994), for example, putting cross-household diversity in the model of Townsend (1980). Again, the evidence for an internal Pareto optimum within the ICRISAT village economies is not wildly inconsistent with this standard; see Townsend (1994). But in its relationship to the larger national economy, the village may act as an aggregated consumer (even if preferences do not aggregate), using currency, crop inventory, and (limited) credit to smooth fluctuations; see the exposition in Townsend (1995). The work of Deaton (1989) would suggest, in particular, that savings play a buffer stock role.

The issue is not what transactions take place within a village or outside a village; if markets function well and local transaction costs are small, internal village prices are driven to external regional prices, and each household would be indifferent to supplying labor in the village or outside it, for example. Labor could be hired in, could be financed with labor exports, for example. We thus add up among all transactions for each household and then add up transactions

over all sampled households in each village. This allows us to see how each village is financing its *aggregate* balance of permanent deficit. In doing so we are aware of one problem: in Aurepalle an important group of local lenders was not included in the ICRISAT sample of households, thus so-called aggregate deficits in Aurepalle may be financed by within-village lenders, not by the outside economy.

What then are the roles of credit and currency? In Shirapur's annual data these objects play little role (see Figure 20), but in Kanzara and Aurepalle their roles are as large in absolute value as the size of the surplus (see Figures 21 and 22). It appears, however, that currency and credit are offsetting one another, with movements at times unrelated to the surplus itself.

These patterns, though less evident, are present in the monthly data. Shirapur's use of crop inventory remains dramatic; see months 0 - 24, in Figure 23. Kanzara's use of crop inventory is also evident; see months 48 - 72 in Figure 24, but credit and currency are playing a more salient if unrelated role. Finally, Aurepalle's use of crop inventory is much less evident; see months 48 - 72 in Figure 25, with currency and credit playing large if erratic roles.

In conclusion, models of village economies which ignore outside credit would seem to go astray. This is consistent with the work of Rosenzweig (1988), describing the role of remittances and marriages, for example. Nevertheless, outside financial assets are a limited device when it comes to smoothing village consumption. This is consistent with the view often expressed in the literature that within-village credit markets may function well, due perhaps to an information advantage, and external credit markets do not function well, because they are more distant from local borrowers.

The role of currency in smoothing village-level fluctuations is problematic. In Shirapur this role is small, but in Aurepalle and Kanzara the role of currency can be as large as the role of credit. Still, as noted, currency and outside credit seem to be substitutes for one another in the sense that one goes down when the other goes up. Perhaps the villages are solving some kind of portfolio management problem. The relatively simple (but not easy to analyze) turnpike models appear to be missing much of the complexity of village-regional interactions.

6. CONCLUSION

We are not unaware that the results of the paper beg further model construction. We now know, subject to measurement error, that there are salient patterns in the use of currency and crop inventory by land class and that the relative importance of currency, crop inventory and credit varies within and across these villages economies. In two of the three villages, credit and insurance play an important internal role, but simple permanent income or full insurance models are rejected in the consumption and income data. Intermediate private-information models seem to fit the consumption-income data best, but existing models need to be altered to allow nontrivial discretion on the part of individuals in the use of currency, assets and/or credit cum gifts, in the use

of these to smooth consumption intertemporally. Credit also plays a role in financing asset purchases and sales, and this also begs a model. We also need to model better observed patterns of exchange, to get at the costs and benefits of barter and credit as they compete with the role of currency as a media of exchange.

Endnotes

1. The sale of paddy would be from the crop income account 01 if paddy were not yet milled, as in transaction 13, but milled paddy is sold from the consumption account 71. Consumption of paddy used in other papers, e.g., Townsend (1994), represents all paddy milled in a given month plus purchases of milled paddy less sales of milled paddy. To the extent that paddy is milled in one month but sold in another, this procedure overvalues consumption in the first month, and adjusts it later. The problem is that there is no measure of milled grain held in inventory, neither in the original ICRISAT data, nor here, below, when we construct our crop inventory account.

2. The example of transactions in castor is now seen as misleading as it did not allow for depreciation; if the transaction had been recorded in value terms, it would not have allowed for price changes.

3. A related point: loans are often forgiven and we do not see this either.

4. If we do add real asset purchases to the deficit, then the other smoothing devices track the deficit less well. Credit in particular does worse, suggesting that not a small amount of credit is financing real asset purchases. Recall, however, that this helps to keep consumption smooth ceteris paribus.

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Table 1

Structure of the ICRISAT Transaction Data

	money in-flow account					money out-flow account				
example transactions	account number	item code	unit	quantity out	money in	account number	item code	unit	quantity in	money out
1	01	BC	K	36	90					
2	57	HA	H	160	180					
3	57	HB	H	80	22	71	CK	K	20	22
4	21	LM	N	7	70					
5						81	QC		1	3
6						03			50	74
7	01	PX	K	56	72.8	23				72.8
8	62	1			200					
9	62	1			58	73				58
10	61				240					
11						63				500
12	01	CC	K	7	8.4	02	CC	K	7	8.4
13	01	CC	K	18	18	71	CC	K	18	18
14	71	CK	K	7.7	7	71	VB	K	3.5	7

Table 2

Aurepalle, Household Number 41
(Random Choice)
Castor Inventory

sequence	Balance	calendar Year	day of interview	transaction
1	initial balance = x			
2	x + 60	1979	331	harvest 60 kg
3	x + 110	1979	351	harvest 50 kg
4	x +106	1979	352	paid 4 kg wage
5	x + 06	1979	352	sale 100 kg
6	x + 66	1980	10	harvest 60 kg
7	x + 06	1980	23	lending 60 kg
8	x + 60	1980	32	harvest 54 kg
9	x + 10	1980	46	lending 50 kg
10	x + 64	1980	47	harvest 54 kg
11	x + 128	1980	64	harvest 60 kg
12	x + 28	1980	68	lending 100 kg
13	x - 7	1980	88	lending 35
14	x - 27	1980	88	sale 20 kg

Table 3(a)

VILLAGE=Arrequile

goods or services out	goods or services in: money	IOU	grain	other crops	food other than crops	clothing	other consumptions	labor
	value	value	value	value	value	value	value	value
	percent	percent	percent	percent	percent	percent	percent	percent
money	.	0.22	3.92	4.99	0.37	1.52	3.87	0.83
IOU	10.00	0.02	0.93	0.20	0.01	0.43	0.15	0.06
grain	2.34	2.90	0.04	.	0.00	0.00	0.03	4.52
other crops	6.09	0.76	0.00	0.02	0.00	.	.	0.10
clothing	.	0.31	.	.	.	.	0.02	0.00
other consumptions	0.02	.	0.01	.	.	.	.	.
labor	1.00	.	6.56	0.16	0.01	0.00	0.00	0.02
livestock	3.25	0.16	0.00	0.03	.	.	0.01	0.00
physical assets	6.05	0.09	0.03	.	.	.	.	.
jewelry	1.09	0.05	.	.	.	.	0.23	.
consumer durables	0.05	0.33	.	.	.	.	0.02	.
others	10.67	0.00	0.79	0.19	1.19	0.00	0.01	0.01

(CONTINUED)

VILLAGE=Arrequile

goods or services out	goods or services in: livestock	physical assets	jewelry	consumer durables	inputs	others
	value	value	value	value	value	value
	percent	percent	percent	percent	percent	percent
money	2.56	2.69	0.55	2.91	2.30	3.60
IOU	0.31	.	0.37	0.20	0.05	0.04
grain	0.02	.	.	0.01	.	0.02
other crops	0.05	.	.	.	.	0.01
clothing	.	.	.	.	.	.
other consumptions	.	.	.	.	.	.
labor	0.00	.	.	0.00	.	.
livestock	0.22	.	.	.	.	.
physical assets	.	.	.	.	.	.
jewelry	.	.	.	.	.	.
consumer durables	.	.	.	0.06	.	.
others	.	.	.	0.01	.	0.01

Table 3(b)

VILLAGE-Shiraput

goods or services out	goods or services in							
	money	IOU	grain	other crops	food other than crops	clothing	other consumptions	labor
	value / percent	value / percent	value / percent	value / percent	value / percent	value / percent	value / percent	value / percent
money	.	9.57	4.36	6.52	0.93	2.36	4.60	1.47
IOU	10.59	.	0.58	0.24	0.02	0.37	0.03	0.01
grain	3.36	0.36	0.06	0.00	0.00	0.00	0.07	0.00
other crops	6.27	0.10	.	0.00	0.01	0.00	0.00	0.06
food other than crops	0.02	.	.	.	.	.	.	0.00
clothing	0.02	0.11	.	.	.	.	.	0.00
other consumptions	0.01	.	.	0.00	.	.	.	0.00
labor	7.53	0.00	0.61	0.02	0.01	0.00	0.00	0.97
livestock	7.00	0.22	.	.	.	.	.	.
physical assets	1.43	0.27	.	.	.	.	.	.
jewelry	0.35	0.02	.	.	.	.	.	.
consumer durables	0.05	0.14	.	.	.	0.01	0.02	.
inputs	0.03	0.01	.	.	.	.	.	.
others	7.59	0.01	0.62	0.21	0.90	.	0.01	0.00

(CONTINUED)

VILLAGE-Shiraput

goods or services out	goods or services in					
	livestock	physical assets	jewelry	consumer durables	inputs	others
	value / percent	value / percent	value / percent	value / percent	value / percent	value / percent
money	7.00	2.22	0.25	0.40	0.14	5.27
IOU	0.34	0.40	0.06	0.21	0.10	0.00
grain	0.00	0.02	.	.	.	0.95
other crops	.	.	.	.	.	0.51
food other than crops	.	.	.	.	.	.
clothing	.	.	.	0.01	.	.
other consumptions	.	.	.	0.00	.	.
labor	.	.	.	.	.	.
livestock	0.01	.	.	.	.	.
physical assets	.	0.00	.	.	.	.
jewelry	.	.	.	.	.	.
consumer durables	.	.	.	0.00	.	.
inputs	.	.	.	.	.	.
others	.	.	.	.	0.03	0.00

Table 3(c)

VILLAGE-Kanzara

goods or services out	goods or services in: money	ICU	grain	other crops	food other than crops	clothing	other consumptions	labor
	value	value	value	value	value	value	value	value
	percent	percent	percent	percent	percent	percent	percent	percent
money	.	6.79	5.03	4.78	3.03	3.00	7.16	5.33
ICU	6.29	0.02	0.16	0.21	0.02	0.21	0.03	0.07
grain	3.03	0.09	0.00	.	.	0.00	0.00	0.69
other crops	16.76	0.00	.	0.05	.	.	.	0.01
clothing	.	0.02	.	.	.	.	.	.
other consumptions	0.13	.	0.00	.	.	.	.	.
labor	11.03	.	1.10	0.02	0.02	.	.	0.37
livestock	1.70	0.04	0.00	.	.	.	.	.
physical assets	0.03	0.24	0.56	.	.	.	.	.
jewelry	0.11	.	.	.	.	.	.	.
consumer durables	0.15	0.07	.	.	.	.	0.01	.
inputs	0.14	0.00	.	.	.	.	.	.
others	3.90	0.07	0.75	0.07	0.07	.	0.02	0.00

(CONTINUED)

VILLAGE-Kanzara

goods or services out	goods or services in: livestock	physical assets	jewelry	consumer durables	inputs	others
	value	value	value	value	value	value
	percent	percent	percent	percent	percent	percent
money	1.70	2.01	0.07	0.55	2.13	6.69
ICU	0.11	0.40	0.01	0.19	1.41	0.04
grain	0.01	0.15	.	.	.	0.44
other crops	.	.	.	.	.	0.10
clothing	.	.	.	.	.	.
other consumptions	.	.	.	.	.	.
labor	0.01	.	.	.	.	0.00
livestock	0.01	.	.	.	.	.
physical assets	.	.	.	.	.	.
jewelry	.	.	.	.	.	.
consumer durables	.	.	.	.	.	.
inputs	.	.	.	.	.	.
others	.	.	.	.	0.11	0.00

Table 4(a

VILLAGE: Aurequile

goods or services out	goods or services in: money (frequency)	IOU (frequency)	grain (frequency)	other crops (frequency)	food other than crops (frequency)	clothing (frequency)	other consumptions (frequency)	labor (frequency)
money	.	666	2635	20966	566	526	16780	199
IOU	524	2	556	226	0	00	100	1
grain	223	206	16	.	1	4	39	1392
other crops	669	110	1	101	2	.	.	161
clothing	.	70	.	.	.	.	1	2
other consumptions	13	.	10	.	.	.	.	.
labor	433	.	2727	252	2	2	1	35
livestock	254	15	1	4	.	.	2	2
physical assets	46	3	4	.	.	.	.	.
jewelry	10	6	.	.	.	.	1	.
consumer durables	0	57	.	.	.	.	3	.
others	1000	17	479	14	094	2	20	4
total	3900	1220	6629	21559	1673	622	16955	1790

(CONTINUED)

VILLAGE: Aurequile

goods or services out	goods or services in: livestock (frequency)	physical assets (frequency)	jewelry (frequency)	consumer durables (frequency)	inputs (frequency)	others (frequency)	total (frequency)
money	1839	41	17	321	442	1130	46112
IOU	20	.	5	35	13	4	1590
grain	6	.	.	15	.	12	1992
other crops	7	.	.	.	.	9	1060
clothing	.	.	.	.	.	.	77
other consumptions	.	.	.	.	.	.	23
labor	2	.	.	1	.	.	1455
livestock	226	.	.	.	.	.	504
physical assets	.	.	.	.	.	.	53
jewelry	.	.	.	.	.	.	17
consumer durables	.	.	.	1	.	.	69
others	.	.	.	2	.	2	3242
total	2100	41	22	375	455	1165	58210

Table 4(b)

VILLAGE: Shirapur

goods or services out	goods or services in: money	IOU	grain	other crops	food other than crops	clothing	other consumptions	labor
	frequency	frequency	frequency	frequency	frequency	frequency	frequency	frequency
money	.	3235	9375	21971	3010	1091	20692	1130
IOU	1390	.	322	296	39	142	22	7
grain	205	109	69	12	2	1	113	650
other crops	696	51	.	12	10	1	19	86
food other than crops	1	.	.	.	.	.	.	1
clothing	9	41	.	.	.	.	.	3
other consumptions	6	.	.	3	.	.	.	3
labor	3630	1	643	57	5	3	2	713
livestock	781	20	.	.	.	.	.	.
physical assets	17	3	.	.	.	.	.	.
jewelry	6	3	.	.	.	.	.	.
consumer durables	6	50	.	.	.	2	2	.
inputs	3	3	.	.	.	.	.	.
others	1899	6	160	76	2165	.	23	1
total	7843	2532	10369	22623	5311	2040	20872	2602

(CONTINUED)

VILLAGE: Shirapur

goods or services out	goods or services in: livestock	physical assets	jewelry	consumer durables	inputs	others	total
	frequency	frequency	frequency	frequency	frequency	frequency	frequency
money	1899	60	60	310	115	2360	73112
IOU	36	3	0	66	11	14	3362
grain	1	11	.	.	.	186	1239
other crops	.	.	.	.	.	333	986
food other than crops	.	.	.	.	.	.	4
clothing	.	.	.	6	.	.	57
other consumptions	.	.	.	1	.	.	11
labor	.	.	.	.	.	.	4862
livestock	34	.	.	.	.	.	835
physical assets	.	3	.	.	.	.	23
jewelry	.	.	.	.	.	.	9
consumer durables	.	.	.	1	.	.	59
inputs	.	.	.	.	.	.	6
others	.	.	.	.	5	1	3615
total	1970	85	60	382	131	2702	87000

Table 4(c)

VILLAGE: Kanzara

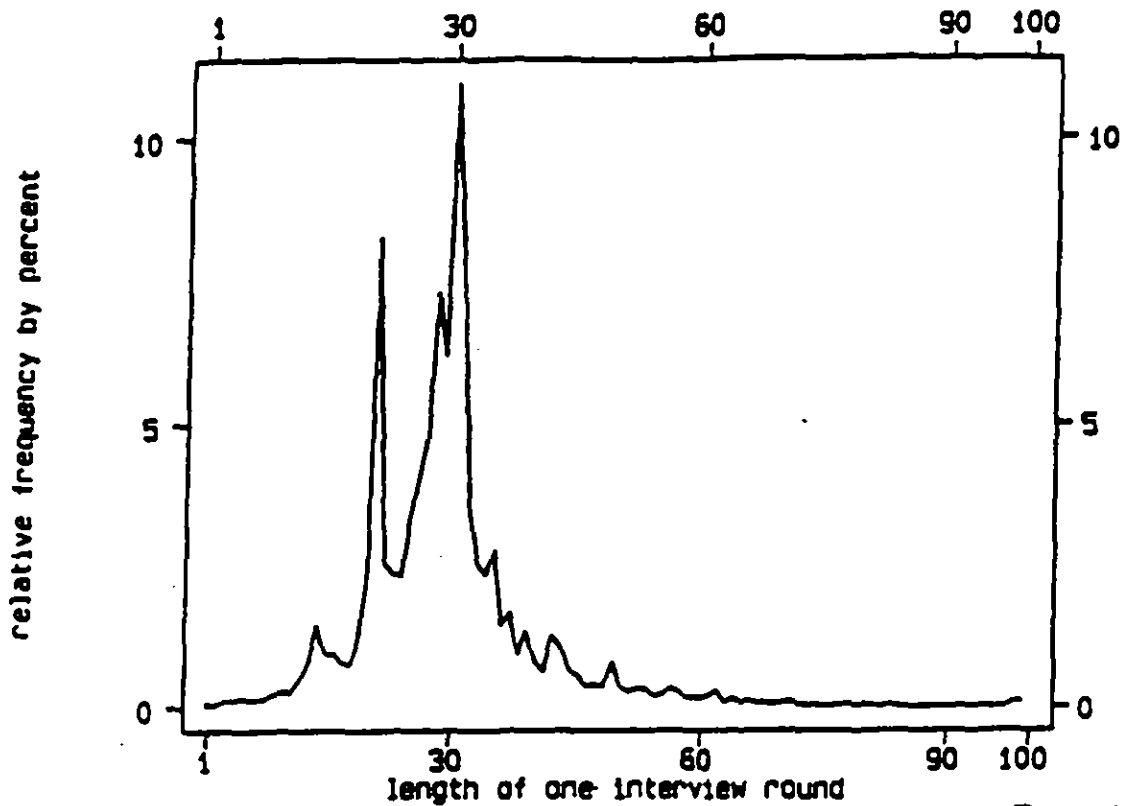
goods or services out	goods or services in: money	IOU	grain	other crops	food other than crops	clothing	other consumptions	labor
	frequency	frequency	frequency	frequency	frequency	frequency	frequency	frequency
money	.	837	7760	23748	5823	2369	31587	1879
IOU	880	2	136	110	65	34	33	36
grain	395	26	22	.	.	3	76	377
other crops	721	3	.	23	.	.	.	22
clothing	.	6	.	.	.	1	.	.
other consumptions	34	.	2	.	.	.	.	.
labor	4512	.	705	26	31	.	.	237
livestock	356	3	2	.	.	.	.	.
physical assets	13	6	13	.	.	.	.	.
jewelry	9	.	.	.	.	.	.	.
consumer durables	37	12	.	.	.	.	3	.
inputs	30	1	.	.	.	.	.	.
others	981	7	154	70	953	.	110	2
total	7550	906	8640	23985	6872	2406	31729	2553

(CONTINUED)

VILLAGE: Kanzara

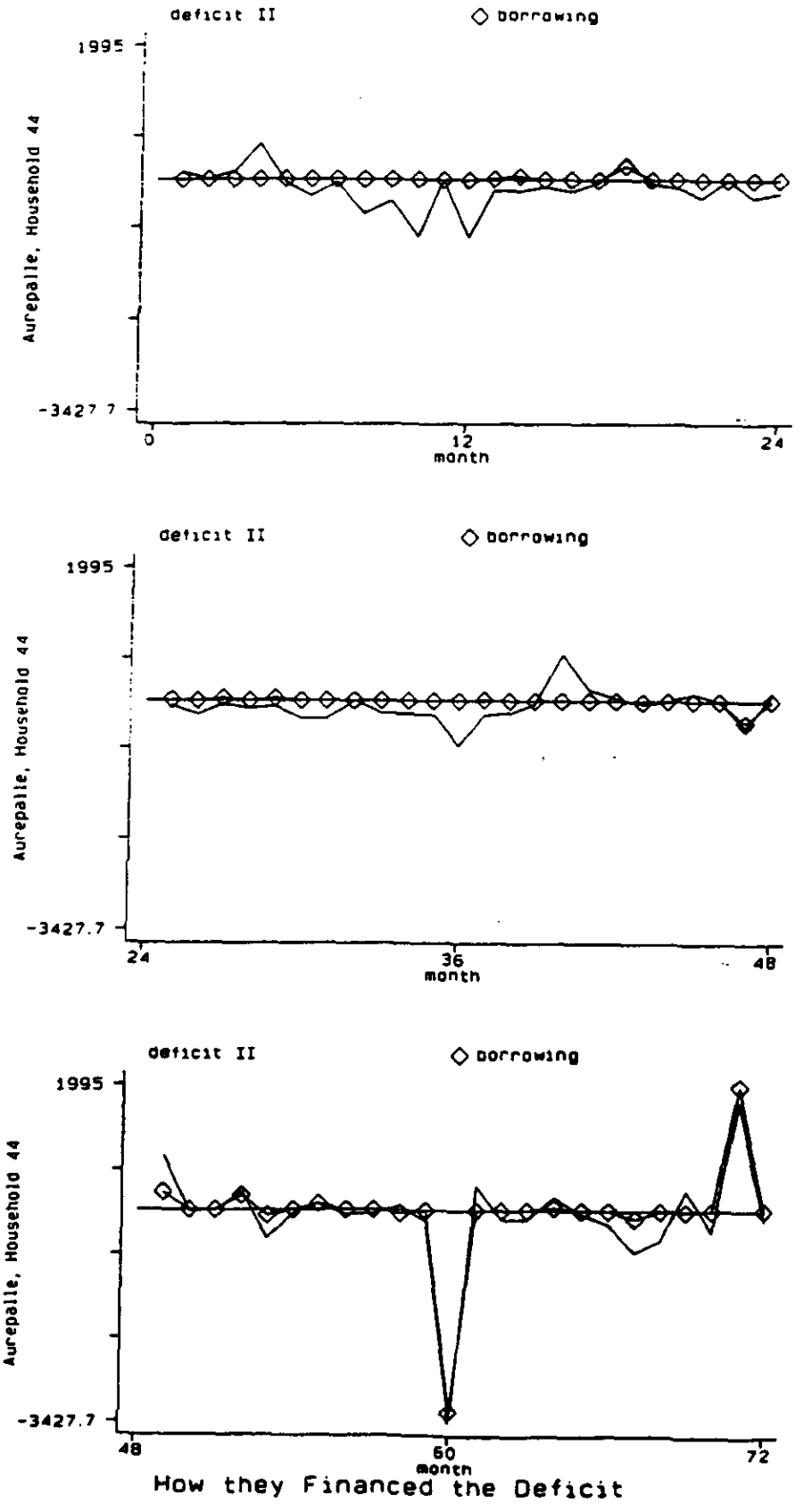
goods or services out	goods or services in: livestock	physical assets	jewelry	consumer durables	inputs	others	total
	frequency	frequency	frequency	frequency	frequency	frequency	frequency
money	1667	97	35	258	382	2227	70369
IOU	34	7	2	24	190	15	1570
grain	7	143	.	.	.	53	1101
other crops	.	.	.	.	.	20	789
clothing	.	.	.	.	.	.	5
other consumptions	.	.	.	.	.	.	36
labor	2	.	.	.	.	1	5590
livestock	2	.	.	.	.	.	363
physical assets	.	.	.	.	.	.	32
jewelry	.	.	.	.	.	.	9
consumer durables	.	.	.	.	.	.	42
inputs	.	.	.	.	.	.	31
others	.	.	.	.	11	1	1097
total	1512	247	37	282	591	2317	89838

Figure I



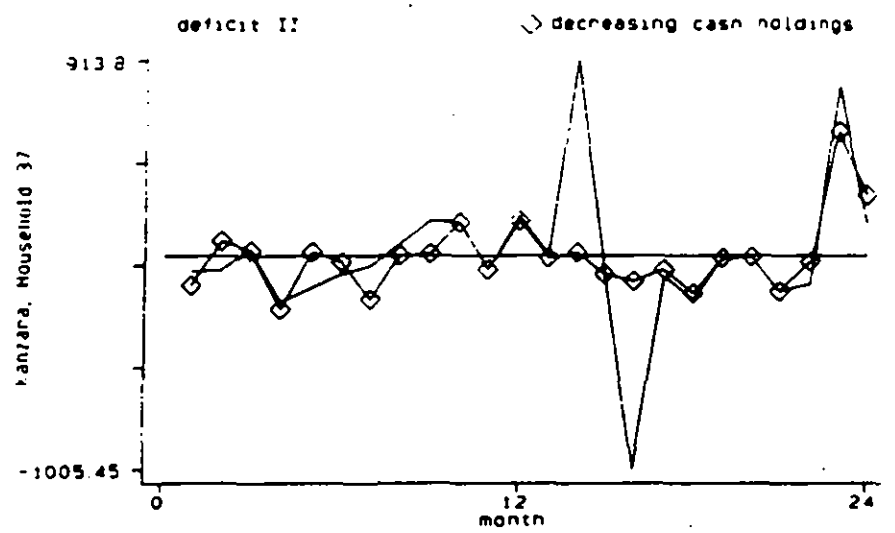
The Distribution of Length of One Interview Round

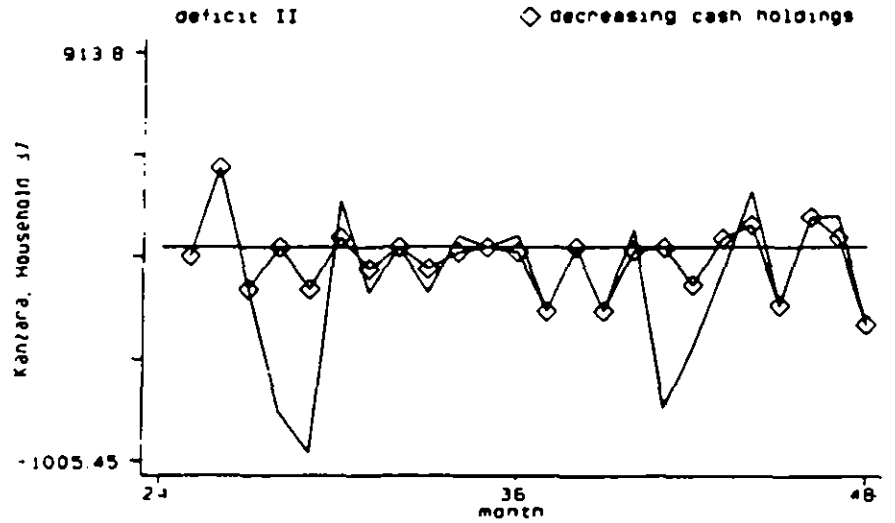
Figure 2

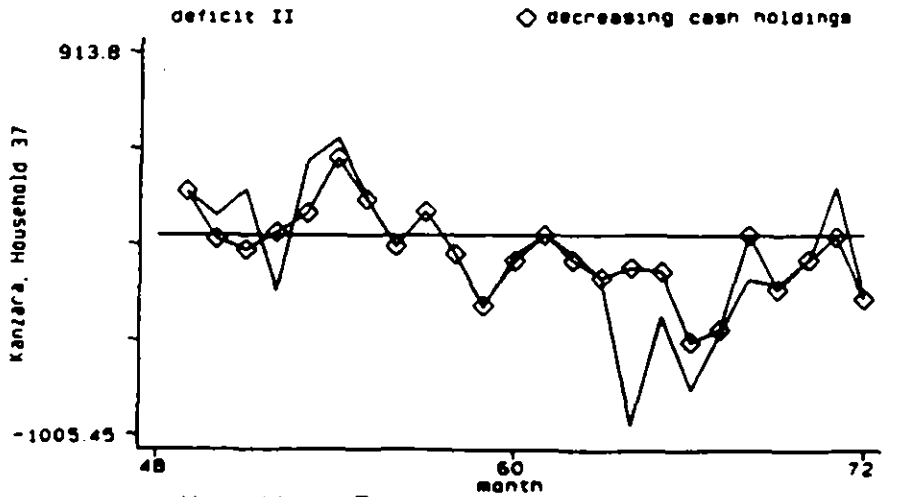


How they Financed the Deficit

Figure 3

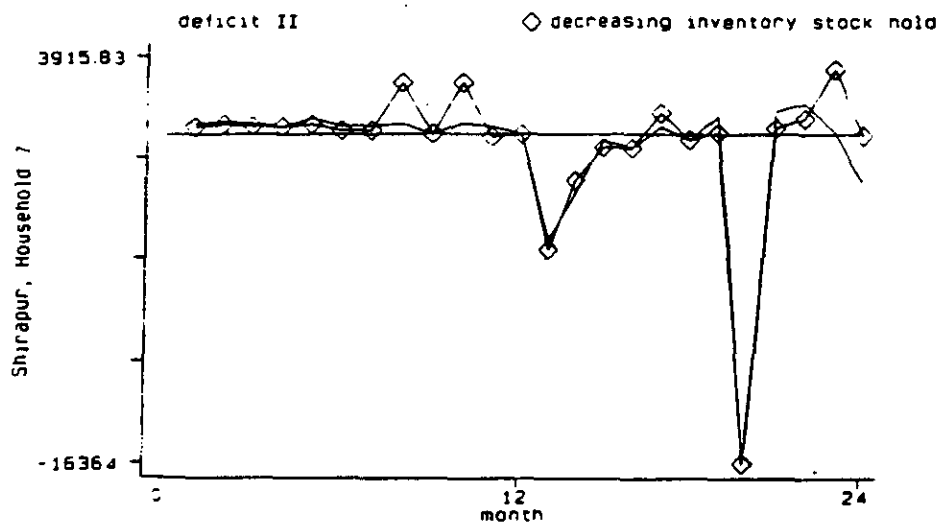


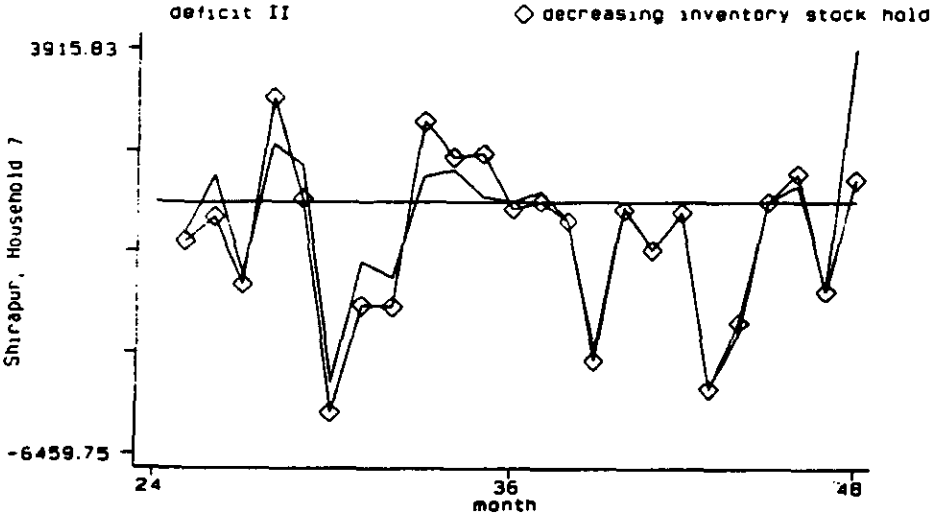


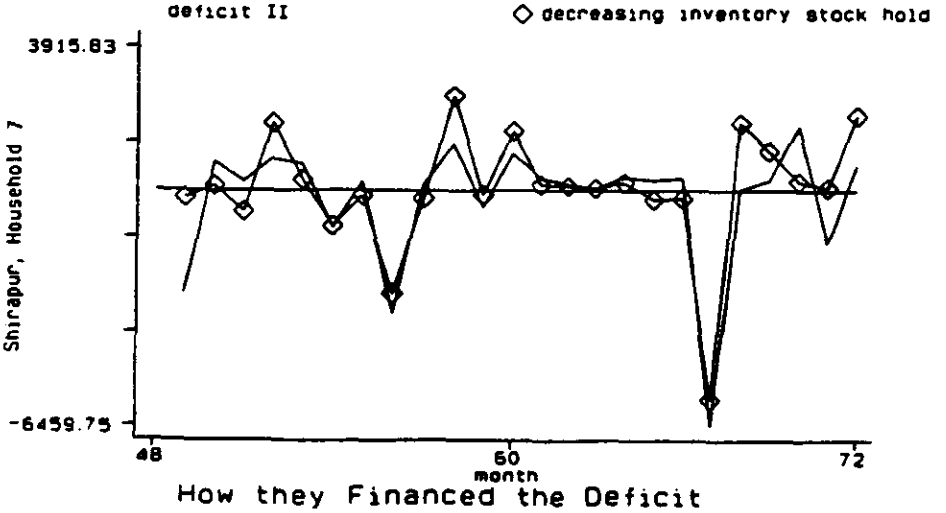


How they Financed the Deficit

Figure 4

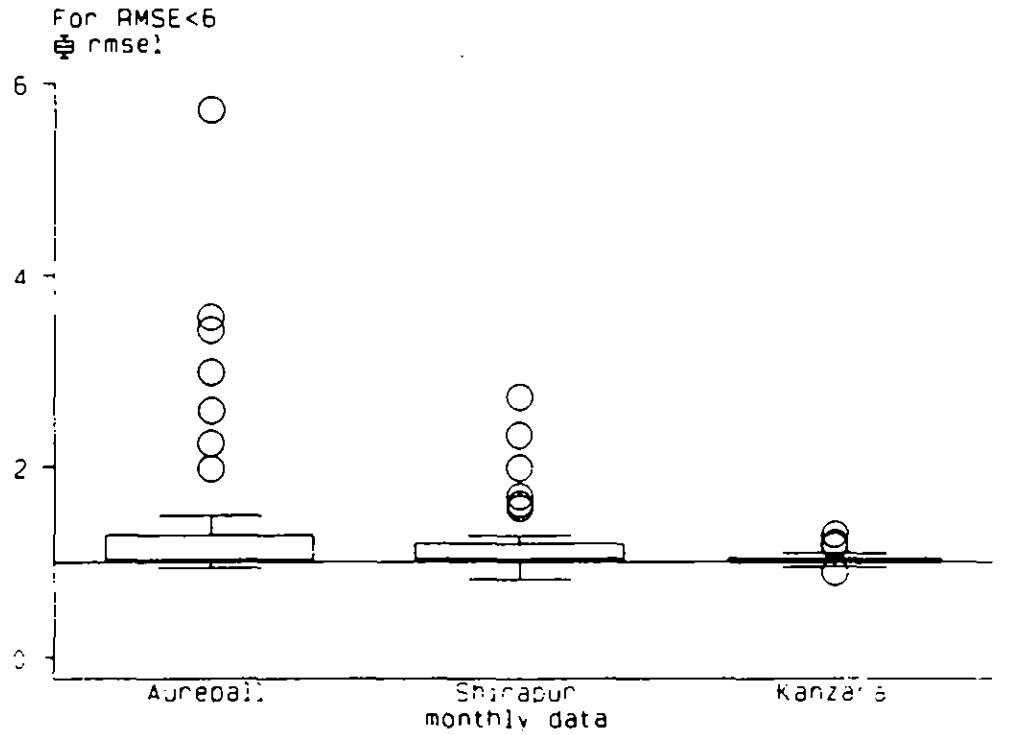






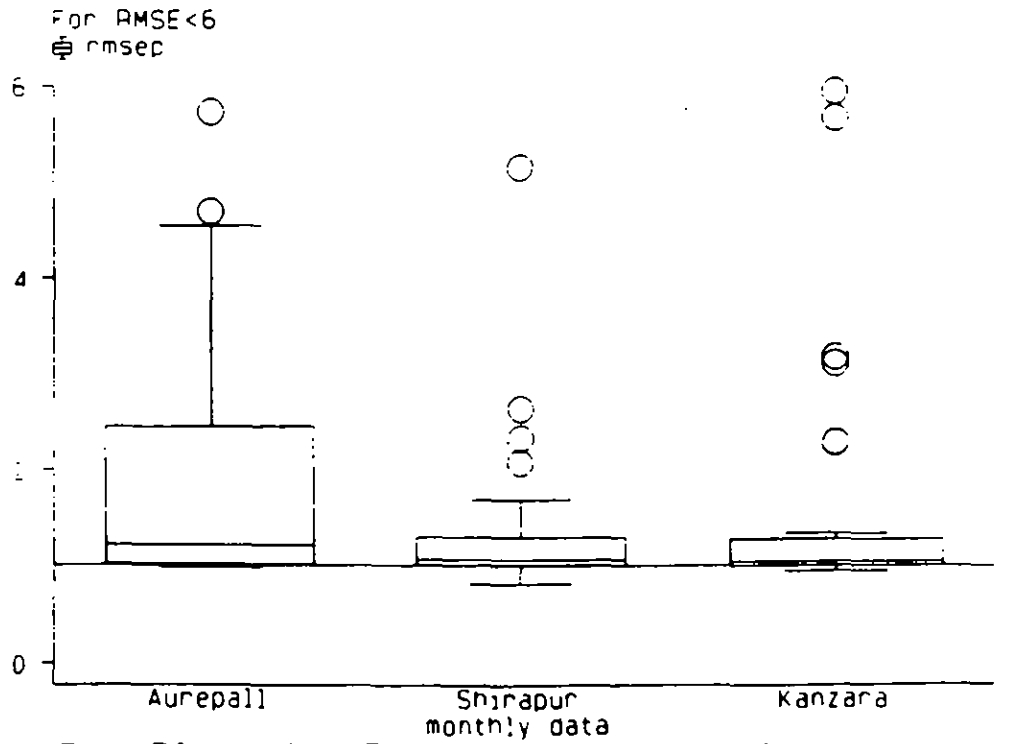
How they Financed the Deficit

Figure 5



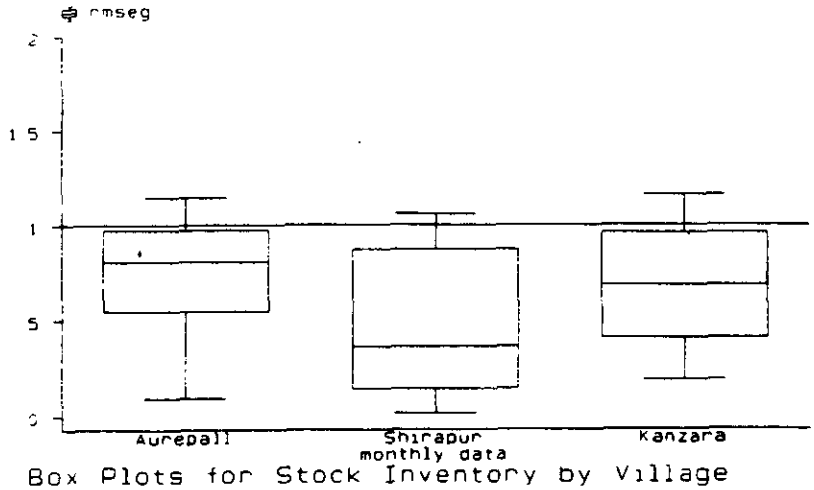
Box Plots for Livestock by Village

Figure 6



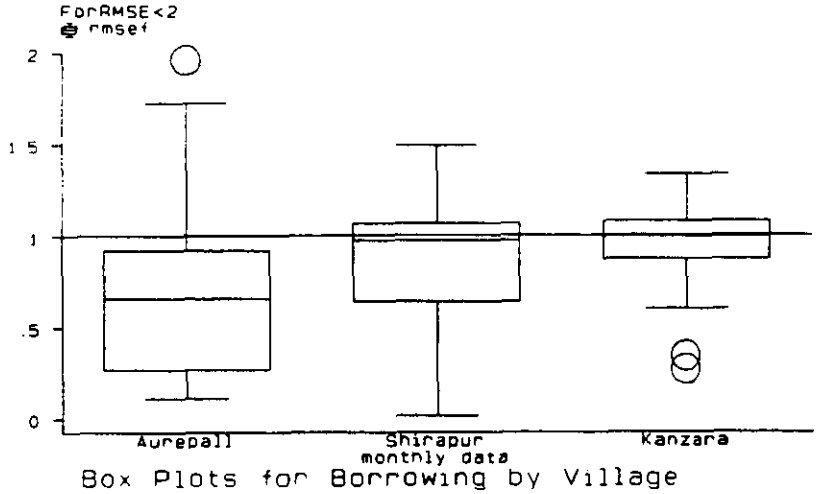
Box Plots for Phys Assets by Village

Figure 7



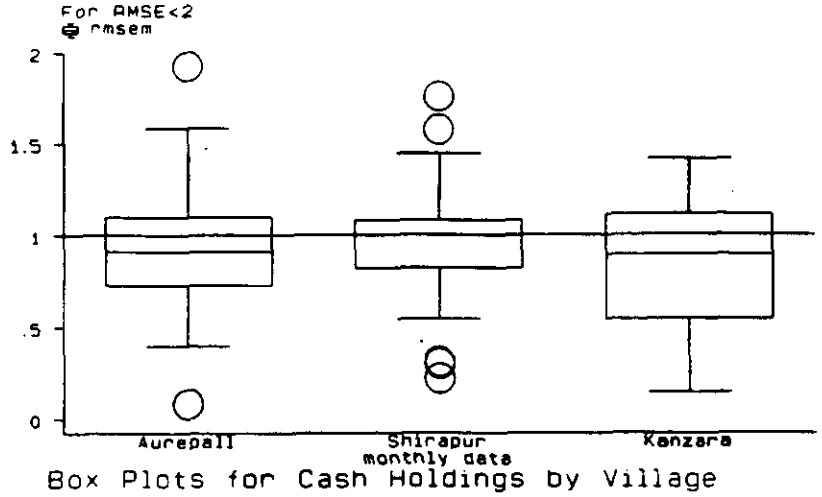
Box Plots for Stock Inventory by Village

Figure 8



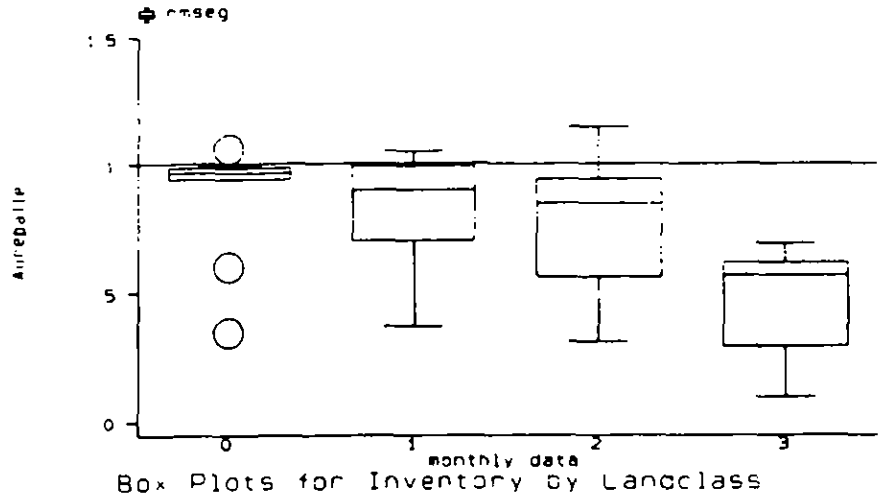
Box Plots for Borrowing by Village

Figure 9

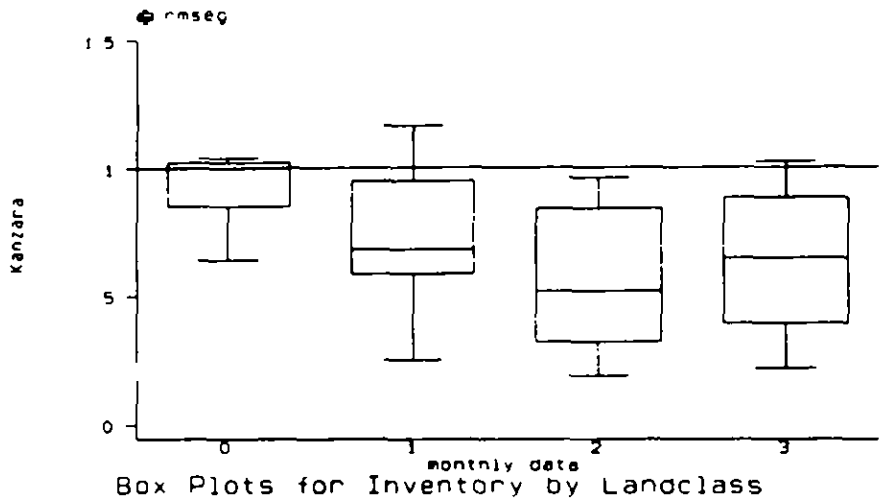


Box Plots for Cash Holdings by Village

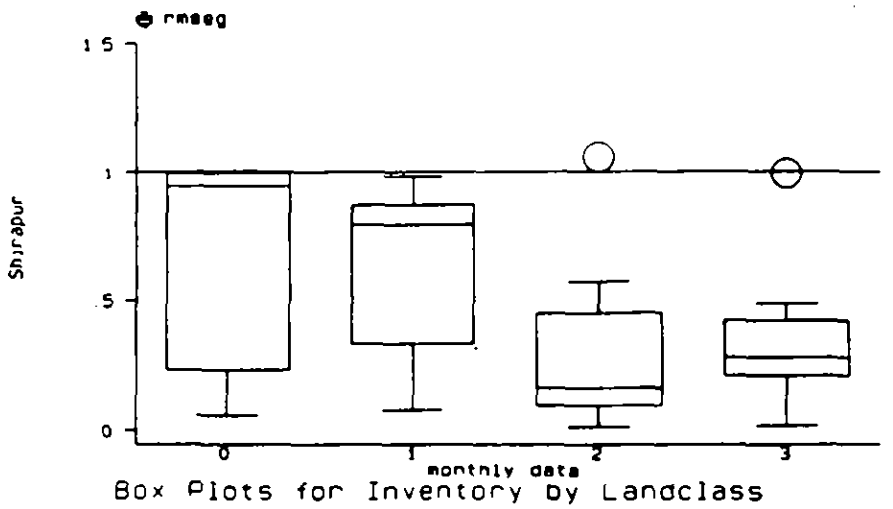
Figure 10



Box Plots for Inventory by Landclass

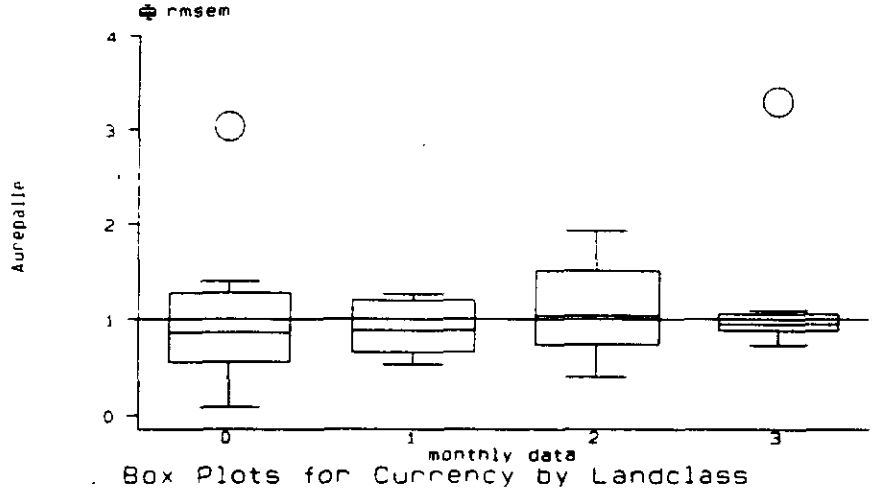


Box Plots for Inventory by Landclass

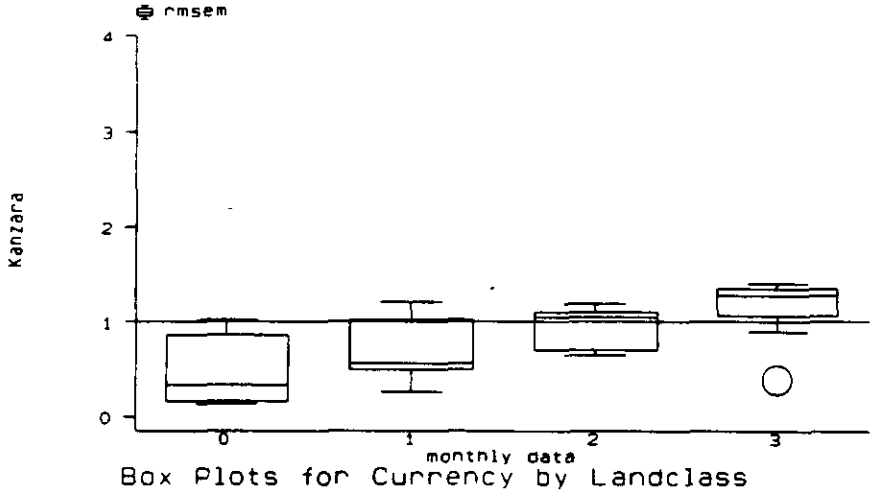


Box Plots for Inventory by Landclass

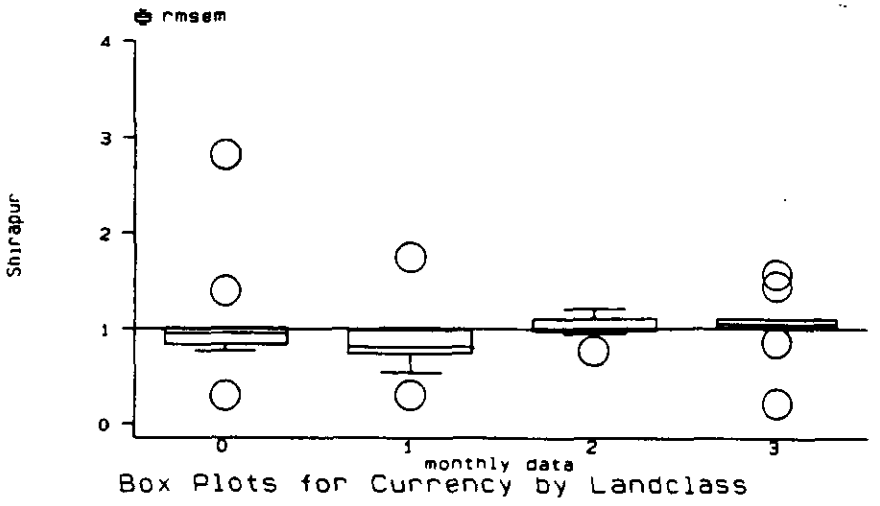
Figure 11



Box Plots for Currency by Landclass

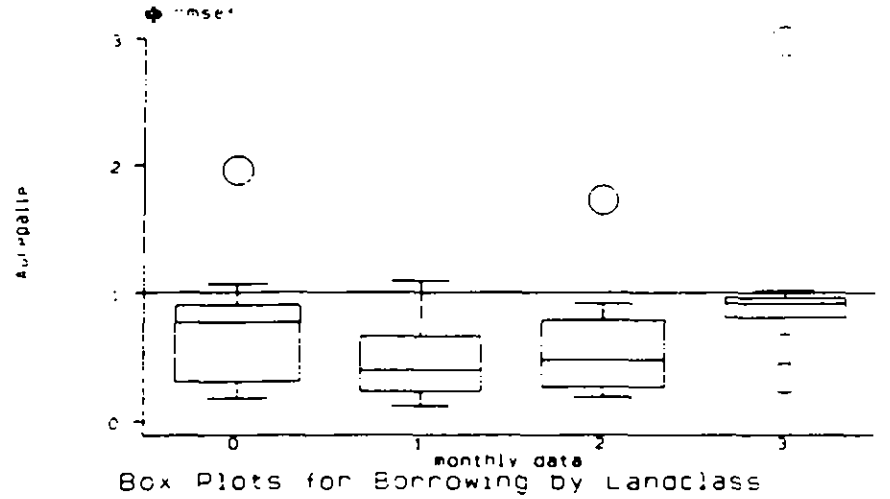


Box Plots for Currency by Landclass

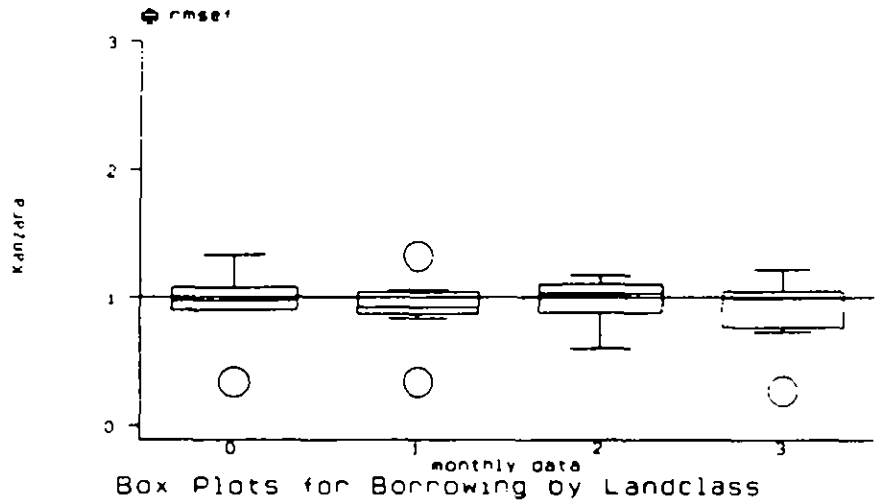


Box Plots for Currency by Landclass

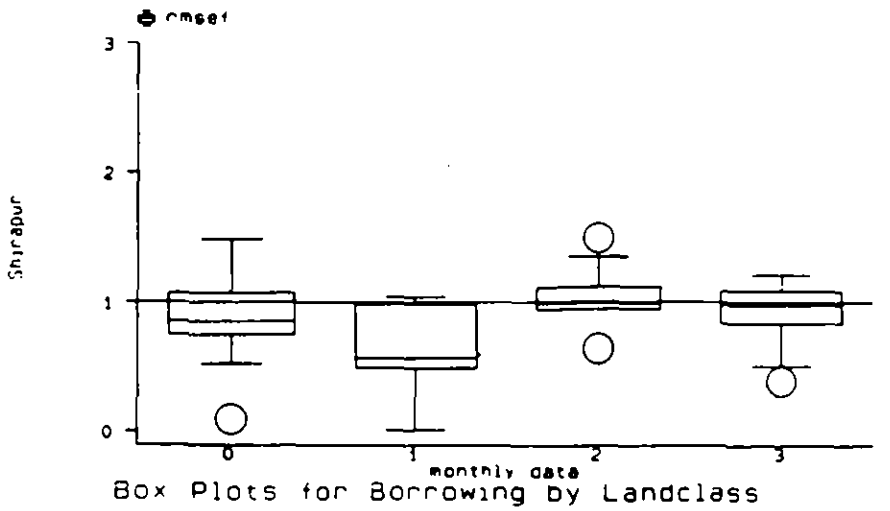
Figure 12



Box Plots for Borrowing by Landclass

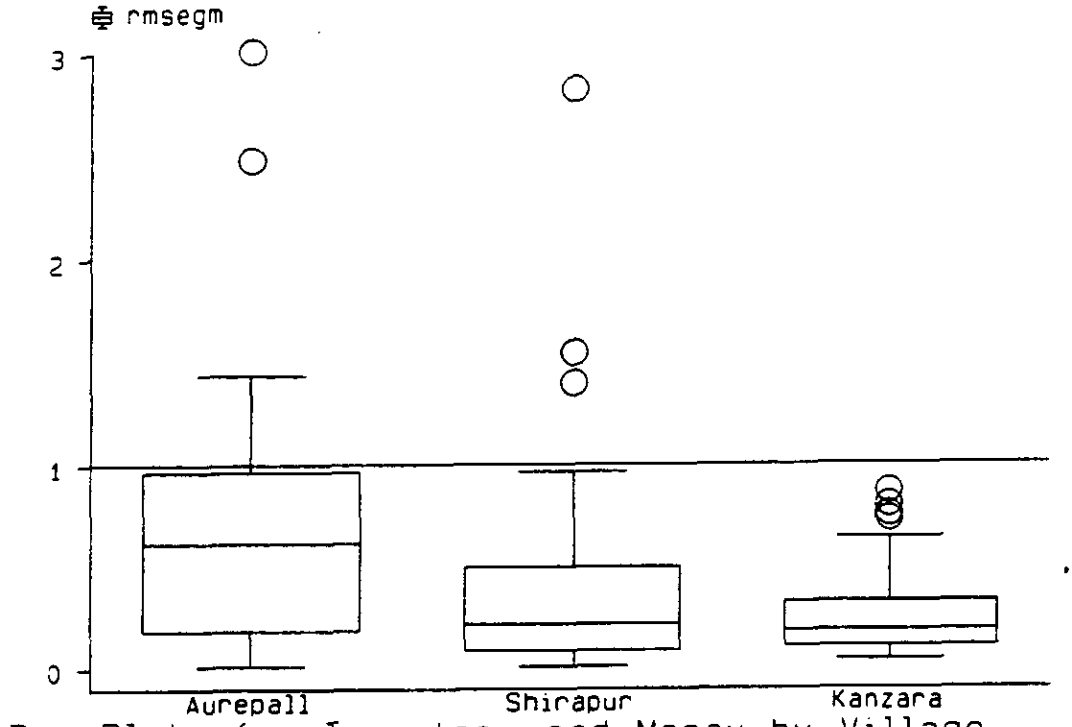


Box Plots for Borrowing by Landclass



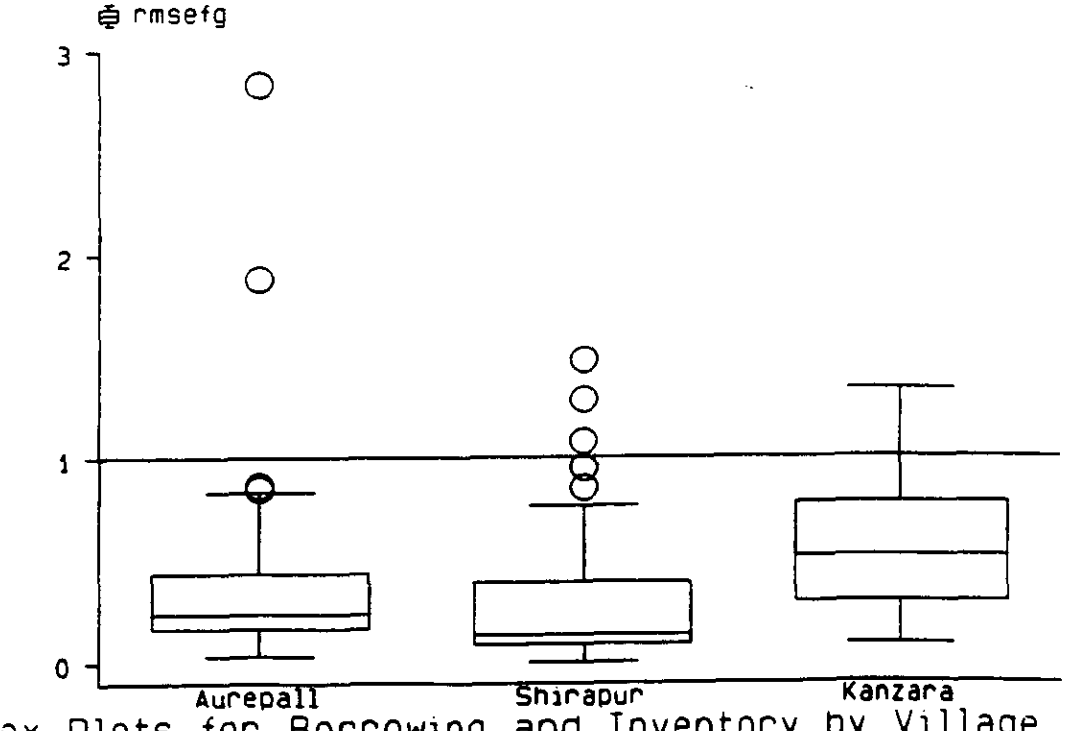
Box Plots for Borrowing by Landclass

Figure 13



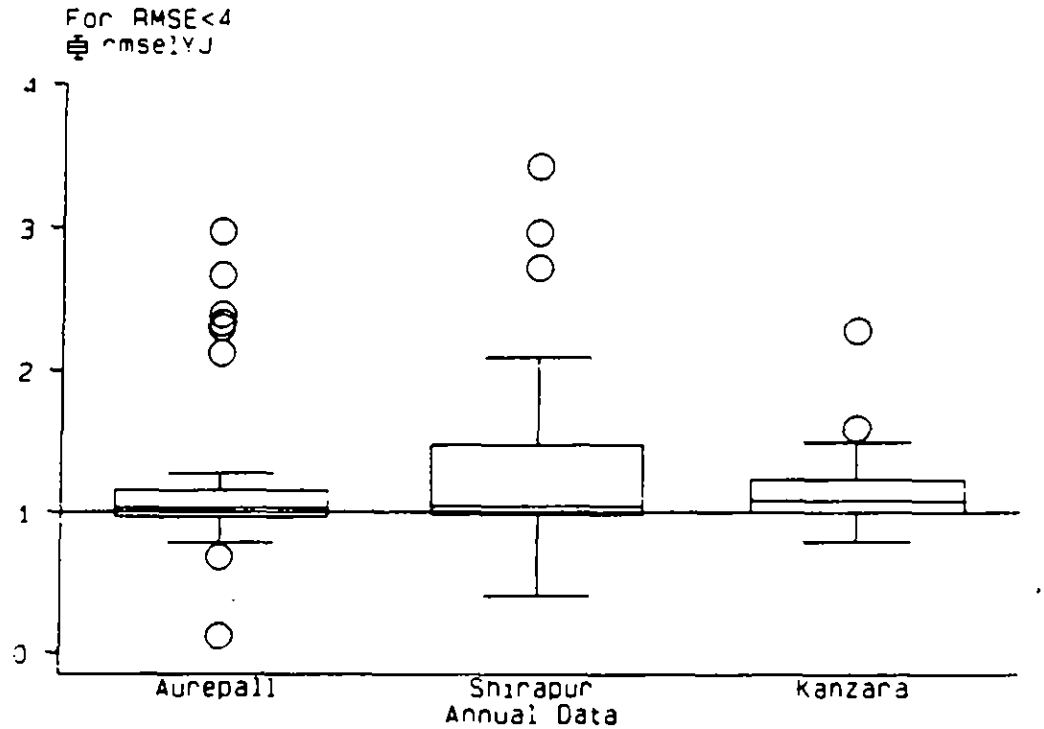
Box Plots for Inventory and Money by Village

Figure 14

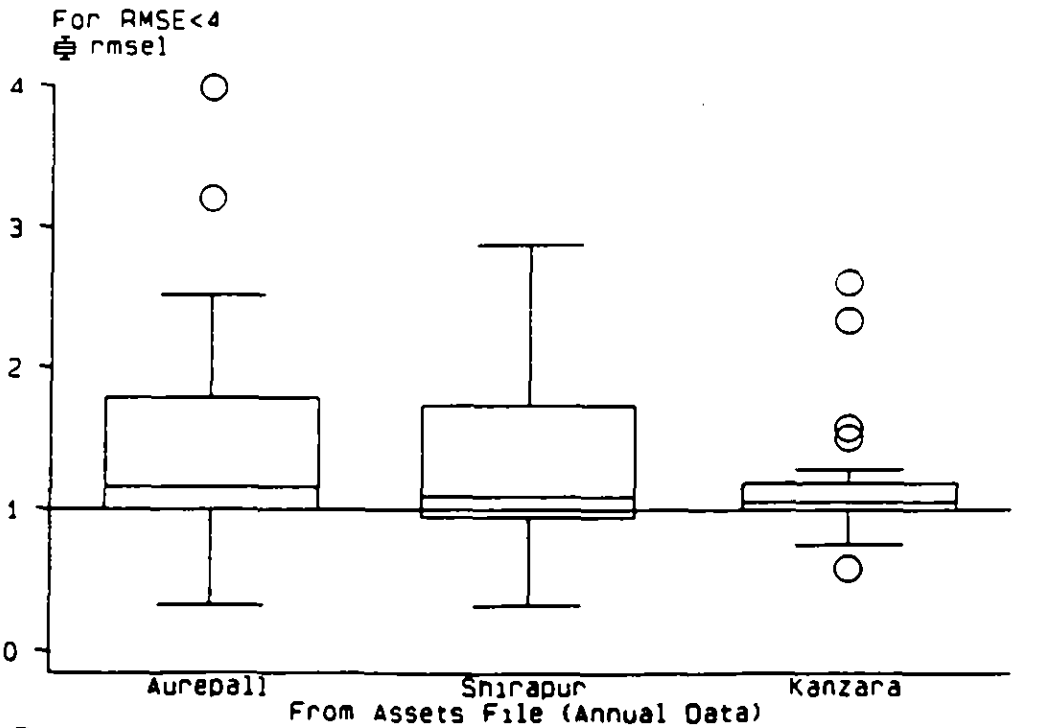


Box Plots for Borrowing and Inventory by Village

Figure 15

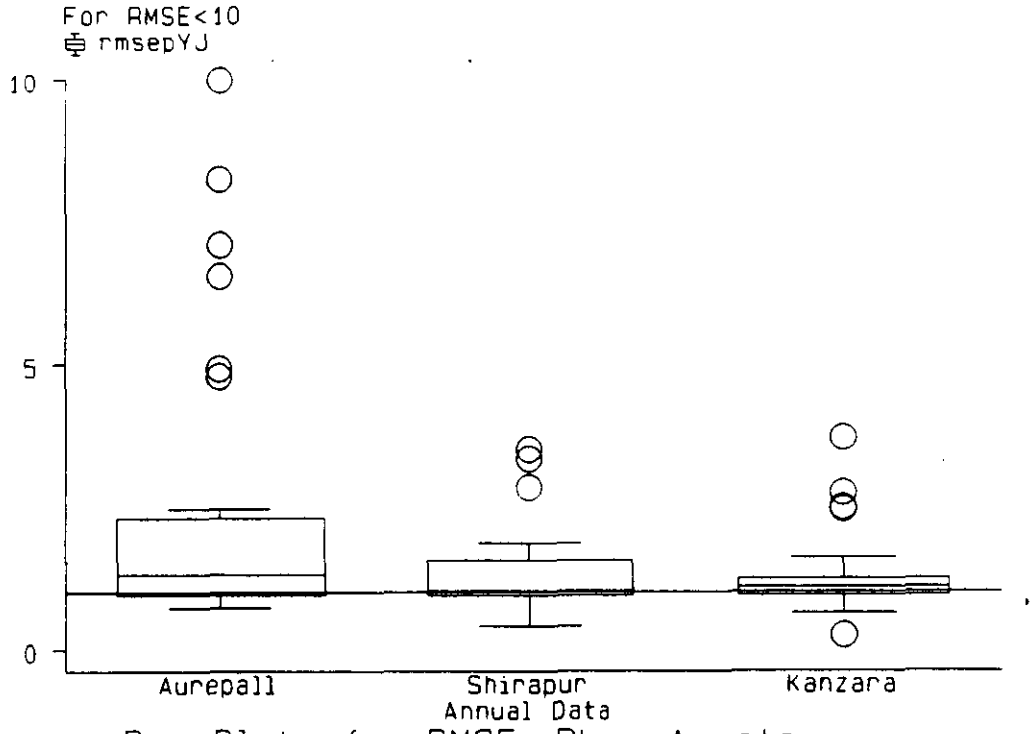


Box Plots for RMSE, Livestock by Village

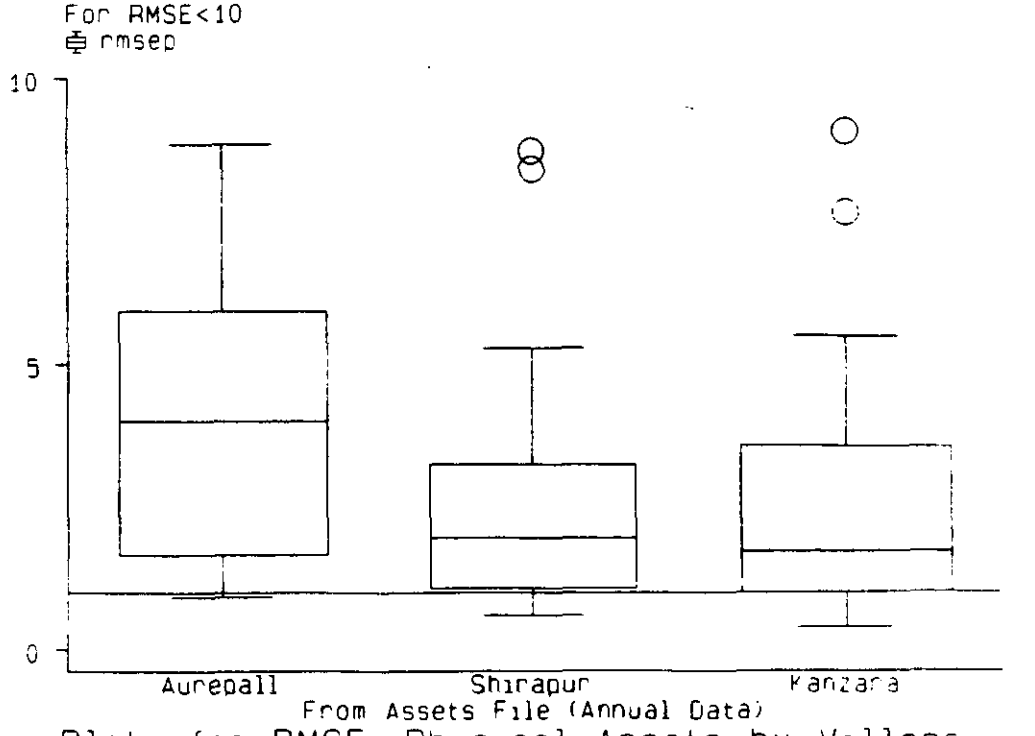


Box Plots for RMSE, Livestock by Village

Figure 16

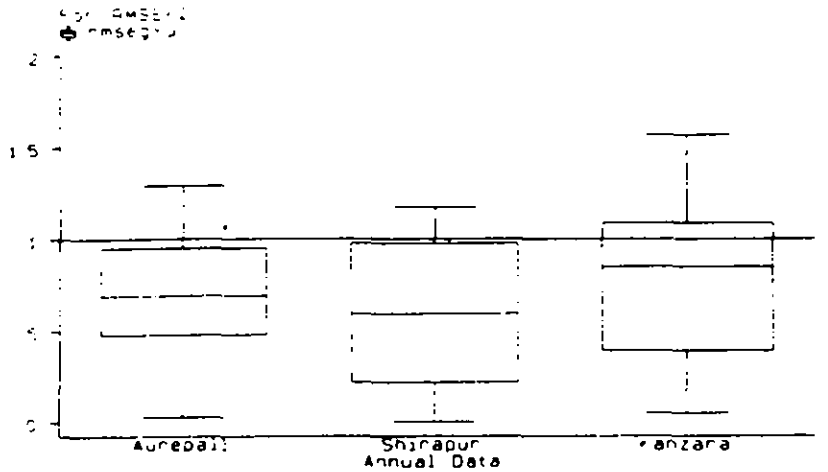


Box Plots for RMSE, Phys Assets



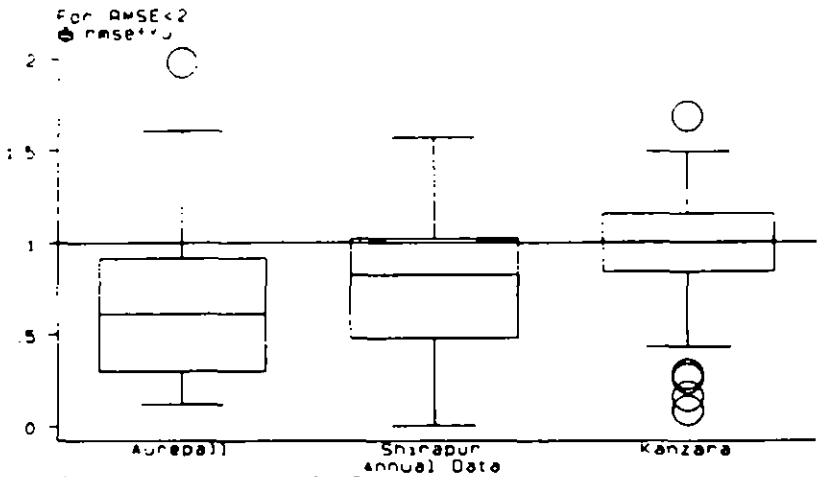
Box Plots for RMSE, Physical Assets by Village

Figure 17



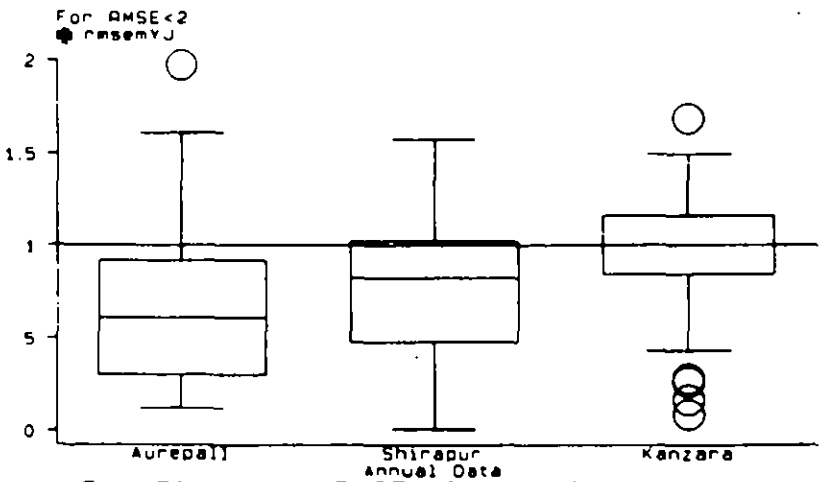
Box Plots for RMSE, Stock Inventory

Figure 18



Box Plots for RMSE, Financial assets

Figure 19



Box Plots for RMSE, Cash Holdings

Figure 20

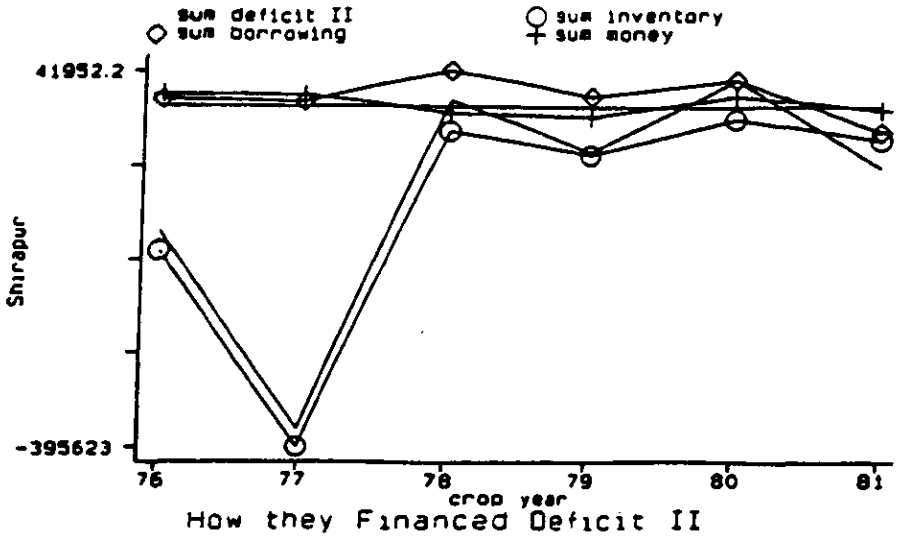


Figure 21

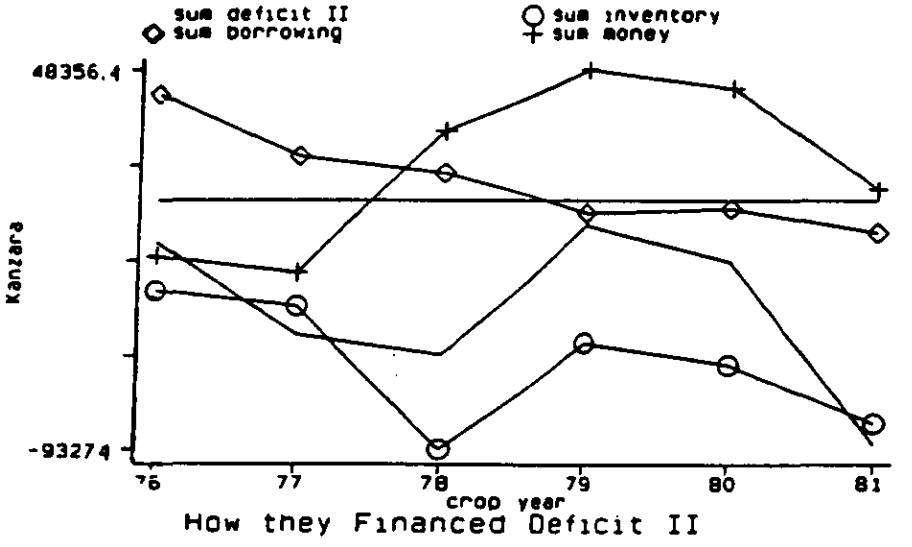
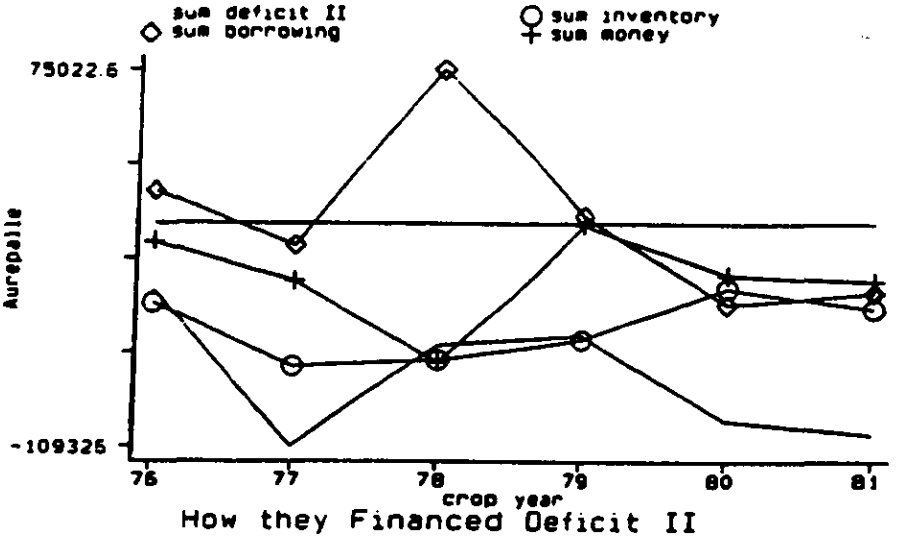


Figure 22



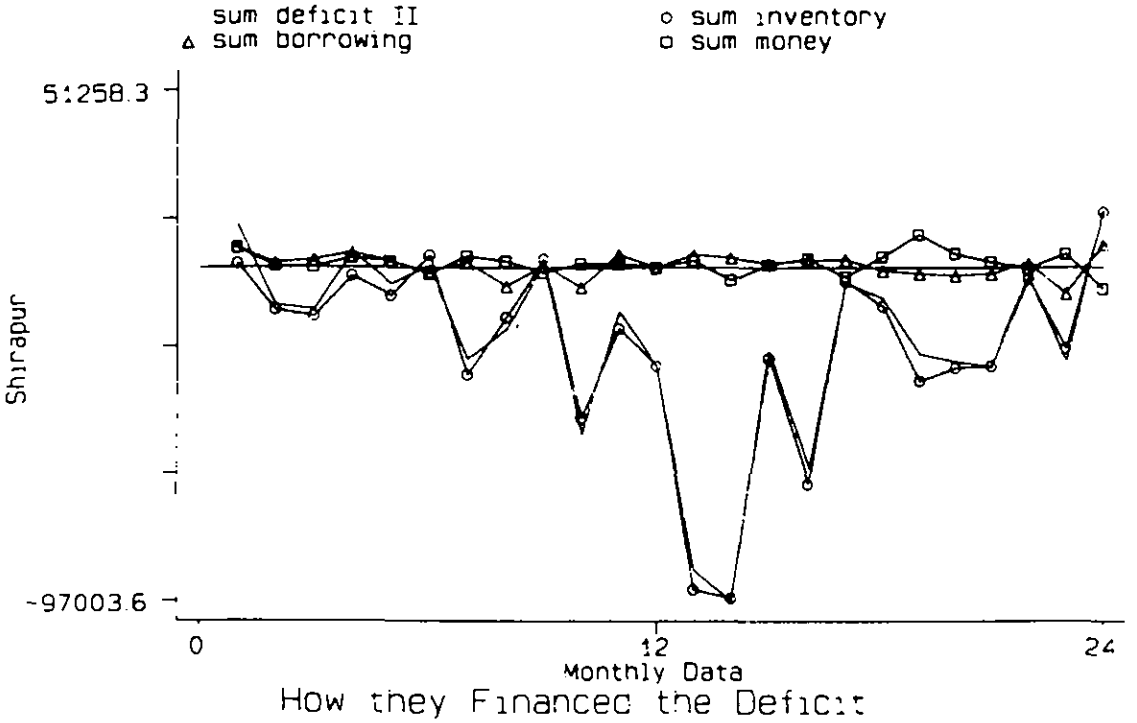


Figure 23

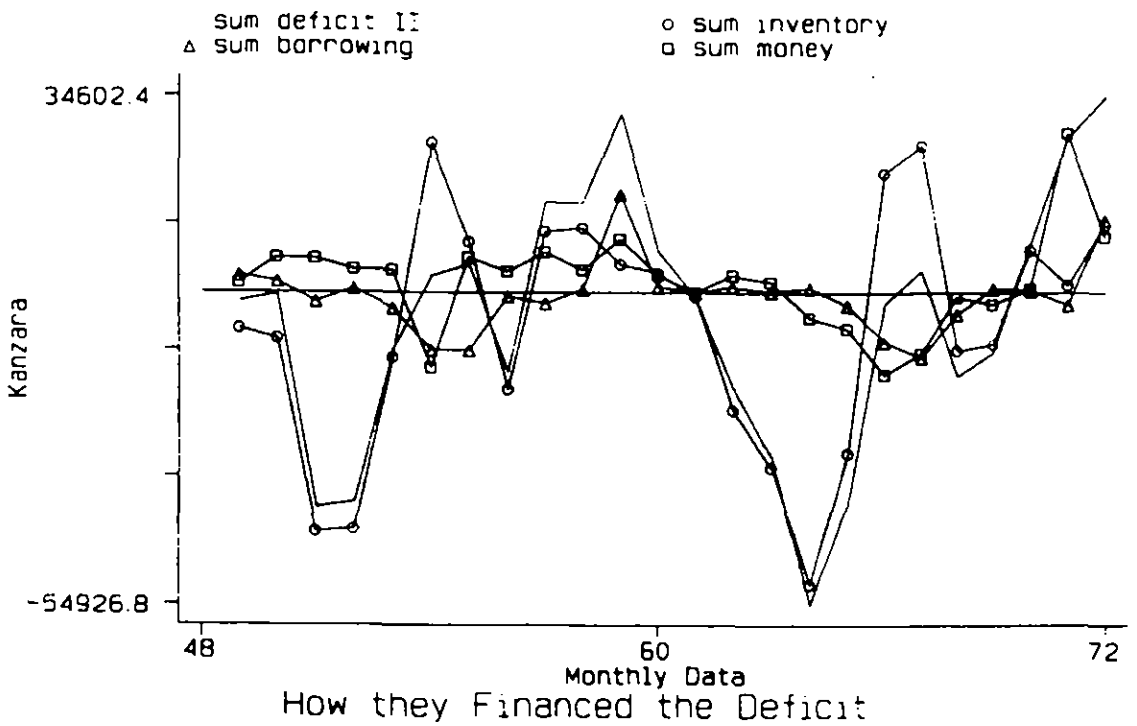


Figure 24

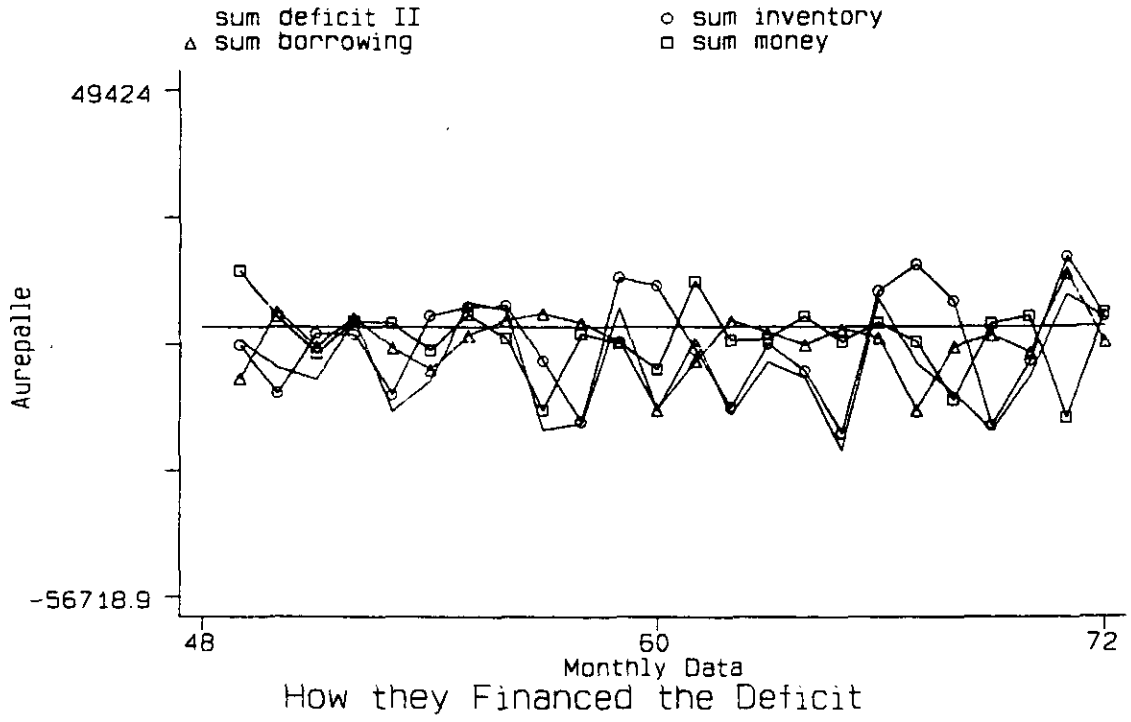

sum deficit II
sum borrowing
sum inventory
sum money
49424
-56718.9
Aurepalle
48
60
72
Monthly Data
How they Financed the Deficit

Figure 25