# REPRESSED INFLATION IN THE SOVIET UNION :

# A TEMPORARY EQUILIBRIUM APPROACH *

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## A B S T R A C T

The soviet economy is modeled by means of temporary general equilibrium theory. Two temporary equilibrium states are distinguished, depending on whether or not consumers face quantitative constraints in state stores. The dynamics of the temporary equilibria of both states are studied.

Simulation of the model offers an explanation for the extraordinary build up of consumer savings deposits since 1955.

# I N T R O D U C T I O N

Until very recently, a macroeconomic theory of a centrally planned economy (CPE), comparable to Keynesian models of capitalist economies, did not exist. Recent econometric work [1] suggests that the growing body of temporary equilibrium theory [2] is capable of supplying just such a macroeconomic theory.

The present paper models the Soviet economy in particular as a temporary general equilibrium, distinguishing between repressed inflation on the one hand and market clearance on the other.

The implications of these two states of the model for the growth of cash balances are considered, and an explanation of the fallling commodity stocks/cash balances ratio is offered [3].

The model also sheds light on various measures of repressed inflation in the Soviet union found in the literature [4]. Thus, one has the prospect of a sound macroeconomic foundation for at least one CPE, a prospect it is hoped further work will fulfill.

# I - THE MODEL

## 1. GENERAL STRUCTURE

The model has four different goods : money M, labor l, consumption good $c_1$, sold in state stores and consumption good $c_2$, sold on the collective farm markets. M, besides being the medium of exchange, is the sole asset. It is assumed that labor l is in fixed supply $l_o$, for instance because the state maintains by law full employment, and is paid a wage w fixed by the state. There are thus two markets in the economy. In the state market, money is traded against state supplied goods $c_1$ at price $p_1$, again fixed by the state. In the collective farm market, money is traded against goods $c_2$ at price $p_2$, determined by market forces but influenced by state policy. Money not spent is accumulated in the form of cash balances for the next period. There are thus two agents in the aggregate model : the worker-consumer, and the state, as represented by the central planner.

State output $y_1$ available in the current period is exogenous to the model, for instance being given by the 5-year plan. The central planner decides how much of available output should go to the government g, and how much show be supplied to consumers $c_1$. If state supply is less than consumer demand at the preexisting price $p_1$, the consumer then faces a quantitative constraint, demand $\leq$ state supply. State supply not allocated to the consumer or to the government, is used to build inventories i.

The basic hypotheses underlying the model have been chosen to portray at least broadly Soviet reality :

- The price $p_1$ is maintained constant over time.
- Wages w are adjusted in accordance with the growth of state supply to consumers.
- State spending g is weighed against its impact on consumer consumption $c_1$.

The remainder of this section will describe in greater detail the behavior of the different agents and the working of the various markets.

## 2. THE CONSUMER AND QUANTITY-RATIONING

The consumer has a utility function with arguments $c_1$ , $c_2$ , and real cash balances $M/p^e$ ,

$$U = U(c_1 , c_2 , M/p^e) ,$$

where $p^e$ is the price level expected in the next period. The presence of real cash balances is based on a dynamic programming argument for the intertemporal maximization [5]. Labor supply $\ell_o$ , being fixed, is suppressed in the utility function. At each time period t, the consumer faces the budget constraint

$$p_1(t)\ c_1(t) + p_2(t)\ c_2(t) + M(t) \leq \bar{M}(t) + w(t)\ \ell_o$$

where $\bar{M}(t)$ is the cash balance of the consumer at the beginning of the period. Consumers are never rationed on the market for good $c_2$ ; however, they may encounter quantity rationing on the market for good $c_1$ . This takes the form of the constraint

$$c_1(t) \leq x(t)$$

Denoting by $(c_1^*(t) , c_2^*(t))$ consumer desired consumption of goods when no quantity rationing is present, the evolution of cash balances $\bar{M}(t)$ is

$$\bar{M}(t+1) = \bar{M}(t) + w(t)\ell_o - p_1(t)c_1^*(t) - p_2(t)c_2^*(t)$$

On the other hand, when the rationing constraint is binding, denote consumer demands by $(x(t)\ ,\ \tilde{c}_2(t))$ , in which case

$$\bar{M}(t+1) = \bar{M}(t) + w(t)\ell_o - p_1(t)x(t) - p_2(t)\,\tilde{c}_2(t)$$

The following parametric utility function [6] (Cobb-Douglas) is adopted for ease of manipulation :

$$U(c_1\ ,\ c_2\ ,\ M/p^e) = \alpha \log c_1 + \beta \log c_2 + (1-\alpha-\beta)\ \log M/p^e$$

With this specific form, utility maximization leads to

$$c_1^*(t) = \alpha\,\frac{\bar{M}(t) + w(t)\ell_o}{p_1(t)}\ ,\quad c_2^*(t) = \beta\,\frac{\bar{M}(t) + w(t)\ell_o}{p_2(t)}$$

when no quantity rationing is present and

$$c_1(t) = x(t)\quad ,\quad \tilde{c}_2(t) = \frac{\beta}{1-\alpha}\ \frac{\bar{M}(t) + w(t)\ell_o - p_1(t)x(t)}{p_2(t)}$$

when quantity rationing is present.

Note in particular that the short run propensity to accumulate cash balances out of wage income is greater under quantity rationing, that is

$$\frac{1-\alpha-\beta}{1-\alpha}\ >\ 1-\alpha-\beta\ ,$$

this follows since $\alpha < 1$ and the cash accumulation rules are

$M^* = (1-\alpha-\beta)\ [\bar{M}(t) + w(t)\ \ell_o]$ when no rationing is present, and

$$\tilde{M} = \frac{1-\alpha-\beta}{1-\alpha}\ [\bar{M}(t) + w(t)\ \ell_o - p_1(t)\ \ x(t)]$$

when rationing is present. Thus the consumer exhibits the forced saving that one intuitively associates with repressed inflation.

## 3. THE COLLECTIVE FARM MARKET

Collective farm market supply is represented by a supply function $y_2$ of the form

$$y_2(t) = y_2(p_2 , \theta)$$

where $\theta$ is a state policy variable, reflecting state attitudes toward this market. Increases in $\theta$ correspond to increasingly harsh official attitudes to collectives farm supplies, $\frac{\partial y_2}{\partial \theta} < 0$ .

Price $p_2$ adjusts instantaneously to clear this market

$$y_2(t) = c_2^*(t) \quad \text{or} \quad \tilde{c}_2(t) ,$$

depending on the state of market 1.

In particular, supply is assumed to be price inelastic, subject to the shift parameter $\theta$ :

$$y_2(p_2 , \theta) = y_2(t) - \theta(t)$$

## 4. THE CENTRAL PLANNER

The central planner is assumed to have an objective function including the variables $c_1$ , g , and i of the form

$$V(c_1 , g , i)$$

reflecting the weights placed on consumer and state allocations, as well as state inventories. The latter enter the objective function by an argument analogous to that for real cash balances in the consumer utility function. On the other hand, it is assumed that $\theta$ ,

increases of which reflect increased official hostility to collective farm market production, is determined outside the planner's realm by overriding ideological objectives.

The central planner maximizes this objective function subject to the allocation constraint

$$c_1 + g + i = \bar{i} + y_1$$

where $\bar{i}$ is the initial inventory of state goods and $y_1$ is current output of state goods as given by the 5-year plan.

The evolution of state inventories then obeys the rule

$$\bar{i}(t+1) = \bar{i}(t) + y_1(t) - c_1(t) - g(t) \ .$$

Note in particular that state determined supply $c_1$ , need not be equal to consumer demand ; if anything, it is likely to be lower [8].

The following specific functional form is assumed for the central planner, analogous to the consumer :

$$V(c_1 \ , \ g \ , \ i) = c_1^{\gamma} \ g^{\delta} \ i^{1-\gamma-\delta}$$

It is easy to see that the central planner's optimal policy is

$$c_1 = \gamma(\bar{i} + y) \ , \ g = \delta(\bar{i} + y_1) \ , \ i = (1 - \gamma - \delta) \ (\bar{i} + y_1) \ .$$

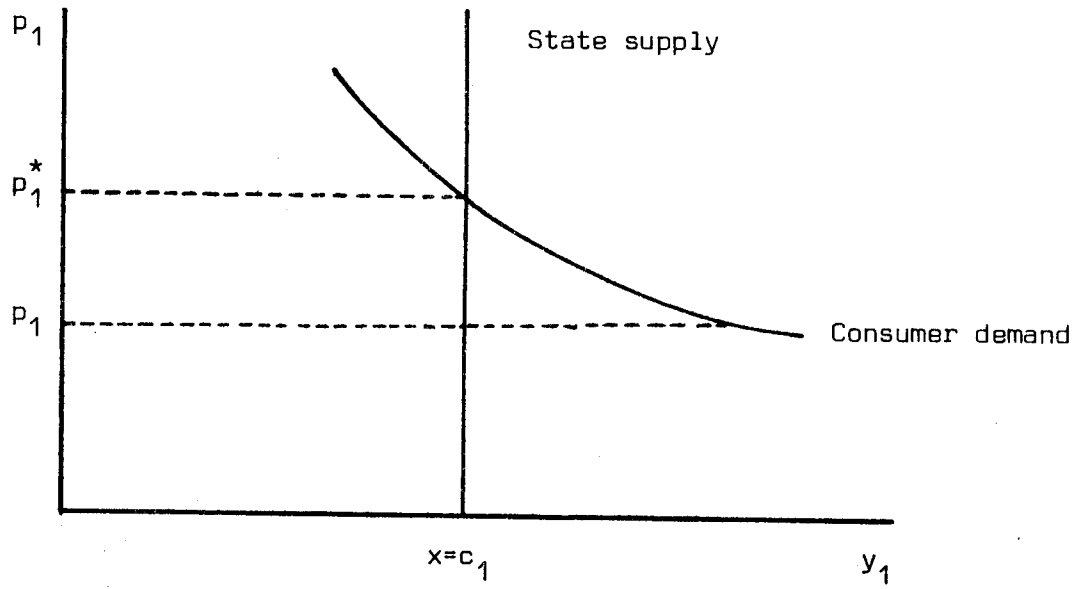
Substituting in the state inventories equation, one then has that

$$\bar{i}(t+1) = (1 - \gamma - \delta) \ (\bar{i}(t) + y_1(t)) \ .$$

This form of inventory seems quite reasonable, given that the official statistical services typically report inventory levels in terms of days of turn over, and that this measure has remained fairly stable [9].

## II - TEMPORARY GENERAL EQUILIBRIUM

In this model, one can distinguish two kinds of short run equilibria, as depicted in the following figure :




Given that the collective farm market clears, if $p_1 = p_1^*$, one has a general equilibrium without quantity rationing. However, if $p_1 < p_1^*$, then there is repressed inflation in the state goods market, which persists even when the collective farm market clears.

In the first case, equilibrium on the state goods market obeys

$$\alpha \frac{\bar{M}(t) + w(t)\, \ell_o}{p_1(t)} = \gamma(\bar{i}(t) + y_1(t))$$

while equilibrium on the collective farm market satisfies

$$\beta \left[\frac{\bar{M}(t) + w(t)\, \ell_o}{p_2(t)}\right] = y_2(t) - \theta(t) .$$

In the second case, where quantity rationing and repressed inflation are present, one has the corresponding equations :

$$x(t) = \gamma(\bar{i}(t) + y_1(t))$$

$$\frac{\beta}{1-\alpha}\left[\frac{\bar{M}(t) + w(t)\,\ell_o - p_1(t)\,x(t)}{p_2(t)}\right] = y_2(t) - \theta(t)$$

Clearly, given $\theta$ , there is an unique equilibrium in each case. In the first case, equilibrium in the state goods market depends solely on parameters of the model fixed in the short run ($\bar{M}(t)$ , $w(t)$ , $p_1(t)$ , $\bar{i}(t)$ , $y_1(t)$) or fixed in the long run ($\alpha$ , $\gamma$ , $\ell_o$) , while the equilibrium collective farm market price is

$$p_2(t) = \frac{\beta[\bar{M}(t) + w(t)\,\ell_o]}{y_2(t) - \theta(t)}$$

In the second case, the quantity of state goods traded is the same, but the equilibrium collective farm market price is now

$$p_2(t) = \frac{\beta}{1-\alpha}\left[\frac{\bar{M}(t) + w(t)\,\ell_o - p_1(t)\,(\bar{i}(t) + y_1(t))}{y_2(t) - \theta(t)}\right]$$

clearly higher than before.

Holzman has applied two measures of repressed inflation to the Soviet economy, here denoted $m_1$ and $m_2$

$$m_1(t) = \frac{p_2(t)}{p_1(t)}$$

$$m_2(t) = \frac{c_2(t)(p_2(t) - p_1(t))}{p_1(t)(c_1(t) + c_2(t))}$$

under the assumption that case two applies. In terms of the present model, those measures are

$$m_1(t) = \frac{1-\alpha}{\beta p_1}\left[\frac{y_2(t) - \theta(t)}{\bar{M}(t)+w(t)\ell_o - p_1\gamma(\bar{i}(t) + y_1(t))}\right]$$

and

$$m_2(t) = \frac{c_2(t)}{c_1(t)+c_2(t)}\left[m_1(t) - 1\right] = \frac{m_1(t)-1}{\frac{\gamma(\bar{i}(t)+y_1(t))}{y_2(t)-\theta(t)} + 1}$$

Note that both measures increase with a decrease in marketed state supply, $\gamma(\bar{i}(t) + y_1(t))$ , so that both qualitatively reflect an increase in repressed inflation. Given than Holzman's intention was to "provide an indicator of the extent to which the state failed to siphon off excess purchasing power from households", [10] an equally good measure would be the concomitant build-up of excess cash balances,

$$\frac{(1-\alpha-\beta)}{(1-\alpha)}\left[\alpha(\bar{M}(t) + w(t)\ \ell_o) - p_1\gamma(\bar{i}(t) + y_1(t))\right] .$$

This measure also increases with decreases in marketed state supply. In addition, it is equal to zero when no rationing is present, thus providing a zero point for measurement of repressed inflation.

## III - DYNAMICS OF EQUILIBRIUM

The dynamics of the model describe a sequence of temporary equilibria of the types just described. If the state market price $p_1(t)$ and both quantities $y_1(t)$ and $y_2(t) - \theta(t)$ are taken as exogenous to the temporary equilibrium system, then the endogenous variables are cash balances $\bar{M}(t)$ , state goods inventories $\bar{i}(t)$ , the wage $w(t)$ , and the collective farm market price $p_2(t)$. The dynamic evolution of these endogenous variables will of course be tied to that of the exogenous variables.

In the market clearing case, the dynamic equations are as follows :

$$\bar{i}(t) = (1-\gamma-\delta)\ [\bar{i}(t-1) + y_1(t-1)]$$

$$\bar{M}(t) = (1-\alpha-\beta)\ [\bar{M}(t-1) + w(t-1)\ \ell_o]$$

$$w(t) = \frac{p_1(t)\gamma[\bar{i}(t) + y_1(t)] - \alpha\bar{M}(t)}{\alpha\ell_o}$$

$$p_2(t) = \beta\left[\frac{\bar{M}(t) + w(t)\ \ell_o}{y_2(t)-\theta(t)}\right] .$$

We shall assume for the present, and verify in the next section, that the following dynamic assumptions on the exogenous variables $p_1(t)$ and $y_1(t)$ closely approximate Soviet data :

—— $p_1(t) = p_1(t-1)$ , that is, there is official price stability in the state market [11].

—— $y_1(t) = (1+k)\, y_1(t-1)$ , $k > 0$ , there is steady growth of state goods at a positive rate of k% per annum.

Under these assumptions one can examine more closely some features of the steady state of the market clearing system. Since

$$0 < 1 - \gamma - \delta < 1 ,$$

in the steady state inventories will be growing at the same rate as output $y_1$ . Solving the first equation

$$\bar{i}(t) = (1-\gamma-\delta)^t\, \bar{i}(o) + (1-\gamma-\delta)\, y(o) \sum_{j=o}^{t-1} (1-\gamma-\delta)^j\, (1+k)^{t-j-1}$$

As $t \to \infty$ , the first term on the right vanishes, and

$$\frac{\bar{i}(t+1)}{\bar{i}(t)} \quad \text{approaches} \quad 1+k .$$

By similar reasoning on the second equation, $\bar{M}(t)$ and $w(t)$ must grow at the same rate in the steady state. Then, from the third equation, $\bar{M}(t)$ and $w(t)$ must also grow at rate k. Finally one can see from the fourth equation that, whatever the collective farm supply behavior, consumer expenditures on the collective farm market will also be growing at rate k. In this way, the steady growth of state output determines the entire system.

As is to be expected, the dynamic evolution of the repressed inflation case is rather different. The dynamic equations here are as follows :

$$\bar{i}(t) = (1-\gamma-\delta)\,[\bar{i}(t-1) + y_1(t-1)]$$

$$\bar{M}(t) = \frac{1-\alpha-\beta}{1-\alpha}\,\left[\bar{M}(t-1) + w(t-1)\ell_o - p_1(t-1)\gamma(\bar{i}(t-1) + y_1(t-1))\right]$$

$$p_2(t) = \frac{\beta}{1-\alpha}\left[\frac{\bar{M}(t) + w(t)\ell_o - p_1(t)\ \gamma(\bar{i}(t) + y_1(t))}{y_2(t) - \theta(t)}\right]$$

In this case, there is no adjustment equation for wages, only the inequality that defines repressed inflation :

$$w(t) > \frac{1}{\alpha\ell_o}\,\left[p_1(t)\ \gamma(\bar{i}(t) + y_1(t)) - \alpha\,\bar{M}(t)\right]$$

That is to say, within this constraint the planner is able to pursue an independent wage policy. For instance, a wage growing at a rate $k_w > k$ would be one such policy. In this case, inventories and state production would grow at rate k in the long run, but cash balances would grow at a higher rate $k_w$ . Even if wages grew at the same rate as output, the repressed inflationary gap as measured by excess cash balances would increase. One can thus conclude that in a system dedicated to official price stability and smoothly increasing output, the state wage policy is the key to the existence and dynamic consequences of repressed inflation.

## IV - APPLICATION TO THE SOVIET ECONOMY

In this section the temporary equilibrium models are applied to the Soviet experience, 1955-75. The main objective is to see to what extent the repressed inflation model simulates

post-Stalinist Soviet trends. We rely entirely on Soviet data for this purpose [12], and do so for two reasons. First, since no inter-country comparisons are to be made, there seems to be no particular danger in doing so. Second, these are the data that are collected for and available to the planning authorities themselves.

It is first necessary to check the assumptions of price stability and steady growth of state production underlying the dynamics of the model. The data in the following table indicate there is no question as to the former :

**Index of State Retail Prices**

**1940 = 100**

| year | 1955 | 1960 | 1965 | 1970 | 1975 |
|---|---|---|---|---|---|
| price index | 138 | 139 | 140 | 139 | 139 |

As to the latter, one has the following :

**Production Index of Consumption Goods**

**1917 = 1**

| year | 1955 | 1960 | 1965 | 1970 | 1975 |
|---|---|---|---|---|---|
| production index | 16 | 24 | 33 | 49 | 68 |
| fitted index | 16 | 23 | 33 | 47 | 68 |

Here the fitted index assumes a constant annual growth rate of 7,5 % starting at 1955 = 16, and tracks the actual series very closely [13].

Turning attention to the three components of state production, we look first at consumer expenditure on the state market :

**Level of State Retail Trade**
**(Aggregate, billions of rubles)**

| year | 1955 | 1960 | 1965 | 1970 | 1975 |
|---|---|---|---|---|---|
| expenditure | 49,4 | 78,0 | 104,8 | 155,2 | 210,4 |
| fitted | 49,4 | 71,0 | 101,9 | 146,5 | 210,4 |

The fitted growth rate is again 7,5 %, although the fit is not quite as good as that for output.

Inventories meanwhile have, if any thing, grown faster than output :

**Goods' Reserves in Retail Trade**
**(end of year billions of dollars)**

| year | 1955 | 1960 | 1965 | 1970 | 1975 |
|---|---|---|---|---|---|
| Goods'Reserves | 12,6 | 24,5 | 35,7 | 45,7 | 58,1 |
| fitted | 12,6 | 18,5 | 27,1 | 39,6 | 58,1 |
| Days of Turnover | 77 | 85 | 96 | 88 | 84 |

The fitted growth rate here is 7,9 %, slightly higher than that for production and consumer expenditure. The growth has however been somewhat erratic, although the turnover measure is fairly stable.

Although no data is available on the state share of consumption goods production, this share may have fallen slightly [14].

We now turn attention to the sources of consumer expenditure. First, the date on wages :

Annual Wages
(including fringe benefits ;
billions of rubles)

| year | 1955 | 1960 | 1965 | 1970 | 1975 |
|---|---|---|---|---|---|
| wages | 55,4 | 80,1 | 119,2 | 178,1 | 243,9 |
| fitted | 55,4 | 80,2 | 116,2 | 168,4 | 243,9 |

The fitted growth rate is 7,7 %, somewhat higher than that of output. Thus, in terms of the model, if the Soviet Union was in a state of repressed inflation at the beginning of the period, it could have remained in such a state throughout the period.

The other source of consumer expenditure in the model is consumer cash balances. In the Soviet Union, these can take two forms, currency and savings deposits at the state bank. Data is available only on the latter, although the behavior of the former has been at least qualitatively similar [15]. The growth of savings deposits has been quite phenomenal :

**Consumers' Bank Deposits**
**(beginning of year ;**
**billions of rubles)**

| year | 1955 | 1960 | 1965 | 1970 | 1975 |
|---|---|---|---|---|---|
| Deposits | 5,4 | 10,1 | 15,7 | 46,6 | 91,0 |
| fitted | 5,4 | 10,9 | 22,2 | 44,9 | 91,0 |

For this series, the fitted growth rate is 15,2 %, more than double that of output and consumer expenditures on state goods. Even when one includes likely currency-holding behavior, the growth rate of cash balances substantially exceeds that of the other variables in the system.

A look at consumer expenditures on the collective farm market will complete this brief survey of the Soviet data. Collective farm market expenditures over the period have been as follows :

| year | 1955 | 1960 | 1965 | 1970 | 1975 |
|---|---|---|---|---|---|
| expenditure | 4,0 | 3,6 | 3,6 | 4,2 | 5,2 |

The official disapproval of this market in the period 1958-1965 shows up in the data as a fall in consumer expenditures, a phenomenon which the present hightly aggregative model cannot explain.

Holzman's indicator of repressed inflation, $m_2$ as computed on the basis of the above date, suggests that repressed inflationary pressures in the Soviet Union have fallen over the period [16] :

**Holzman's Indicator $m_2$ of Repressed Inflation**
**(1955 = 100)**

| year | 1955 | 1960 | 1965 | 1970 |
|---|---|---|---|---|
| indicator | 100 | 30 | 28 | 22 |

This indicator is perhaps being misled by its neglect of developments in the quasi-legal and illegal markets [17]. The consumption category $c_2$, interpreted as a residual, would include other forms of non-state goods consumption besides collective farm market goods.

Although there does not exist sufficient data to estimate the entire model, there is enough data to establish a basis for the tendency of the commodity stocks/cash balances ratio to fall. For this, all that is required are estimates of the dynamic equations governing commodity stocks and cash balances.

Data are available for inventories only for 1955, 1960, 1965, 1970 and annually thereafter. Assuming a linear trend for the missing observations, one obtains the estimated relationship

$$\bar{i}(t+1) = 0{,}19[\bar{i}(t) + y_1(t)] .$$

The fit of this equation is portrayed in figure 2. The largest deviations are $\pm$ 5 billion rubles.

In the Soviet Union, currency in circulation is a state secret. To construct a cash balances series, it is assumed that currency holdings equal savings deposits in 1955, and grow at the same rate as wages during the period [18]. It is further assumed that wages and consumption grow smoothly at their fitted growth rates. The resulting estimate is

$$\bar{M}(t+1) = 0{,}84[\bar{M}(t) + w(t)\,\ell_0 - p_1(t)\,c_1(t)] .$$

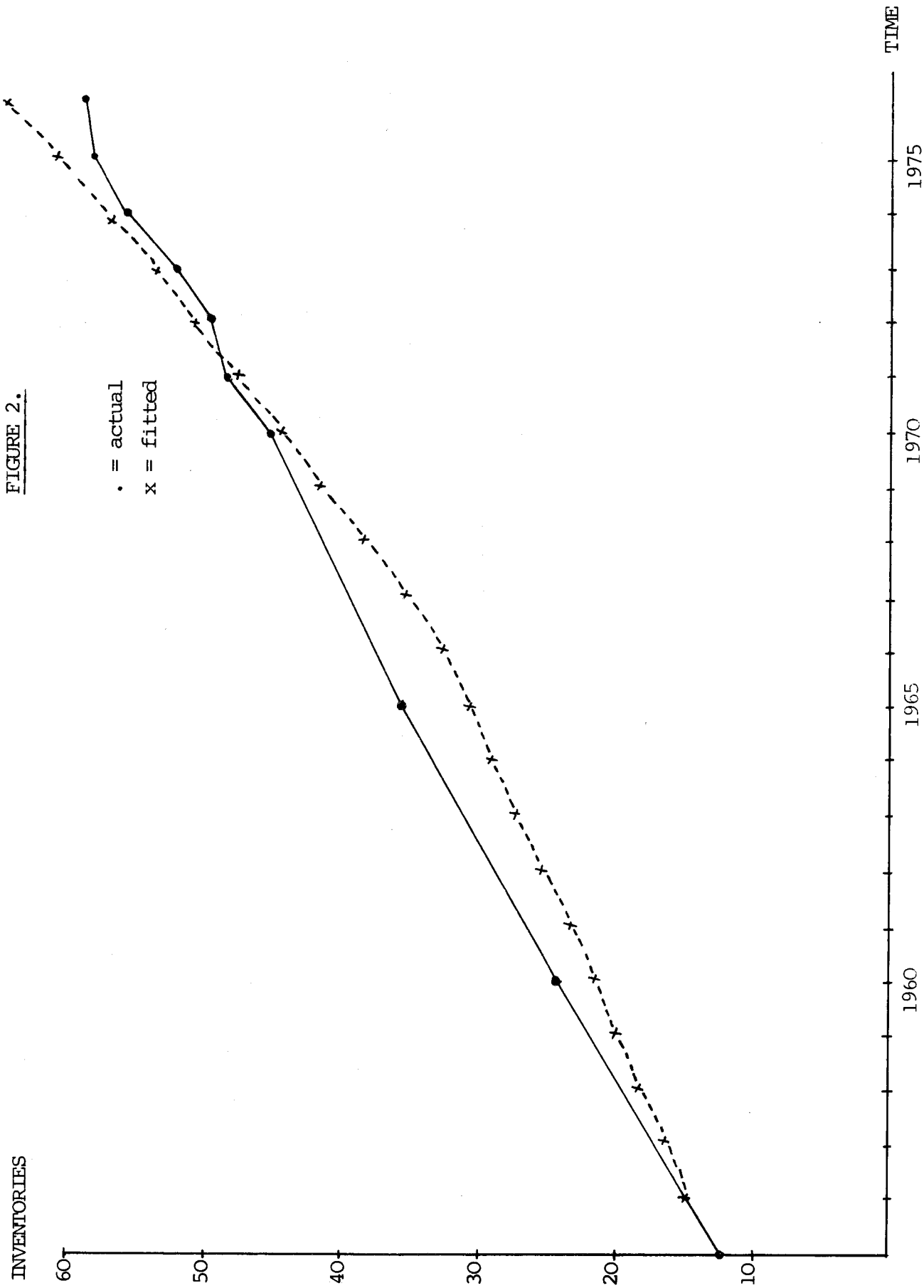

INVENTORIES
60
50
40
30
20
10
1960
1965
1970
1975
TIME
• = actual
x = fitted

FIGURE 2.

The fit of this equation for the savings deposits component of cash balances is portrayed in figure 3. The largest deviation here is $\pm$ 2 billion rubles. Assuming that the Soviet economy was in repressed inflation throughout the period, this estimate implies a value of $\frac{1-\alpha-\beta}{1-\alpha}$ of 0,84.

One further calculates that consumer expenditures on residual consumption $c_2$ have been on the magnitude of 20 billion rubles annually in the early 1970's whereas only 4-5 billion rubles per year have been spent on the collective farm market. Inclusion of the implied semi-legal and illegal expenditure would substantially raise Holzman's indicator $m_2$ [19].

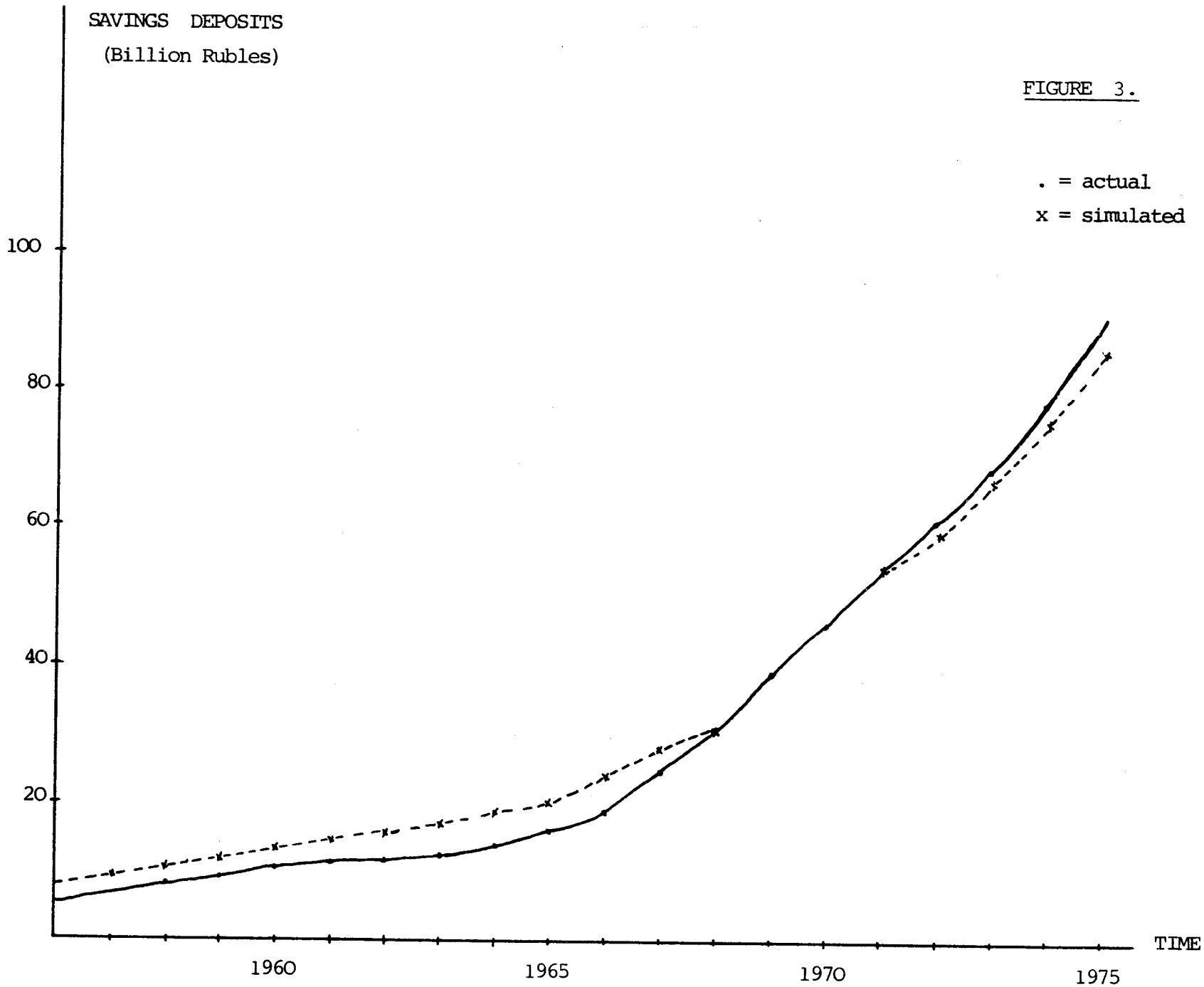
Values of $\alpha$ greater than 0,75 are consistent with the hypothesis of repressed inflation throughout the period. For $\alpha$ as low as 0,75 the implied value of excess cash balances in 1975 is about 50 billion rubles, a figure comparable with total reserves of state consumer goods.

Finally, consider the behavior of the commodity stocks/cash balances ratio implied by the model :

| year | 1955 | 1960 | 1965 | 1970 | 1970 |
|---|---|---|---|---|---|
| actual ratio | 1,2 | 1,4 | 1,3 | 0,7 | 0,5 |
| model estimated ratio | 1,1 | 1,2 | 1,1 | 0,7 | 0,5 |

Despite the roughness of the underlying data and estimates the ratio is tracked fairly well.

FIGURE 3.


SAVINGS DEPOSITS
(Billion Rubles)
. = actual
x = simulated
100
80
60
40
20
TIME
1960
1965
1970
1975

## V - CONCLUSION

This paper has constructed a simple macroeconomic model of the Soviet economy, applying the theory of temporary general equilibrium in the hope that this theory help explain the tendency of the commodity stocks/cash balances ratio to fall in the Soviet Union, 1955-1975. Other important tendencies, among them short term investment cycles and increasing indebtedness to the west, have not been considered. Only a model with endogenous production can do justice to these. Again, there is little reason to believe that the same model holds for other socialist countries, each of which differs significantly from the Soviet Union. Nevertheless, continuation of the tendency here studied can only further jeopardize the internal financial order of the Soviet State.

# F O O T N O T E S

1. The work by Howard [6] and Green and Higgins [4] makes this connection.

2. The present work is greatly influenced by the macroeconomic models of Benassy [1] and Portes [11]. For an introduction to this literature, the interested reader should consult the excellent survey by Grandmont [3].

3. The need for such an explanation is forcefully expressed by Katsenelinboigen [7].

4. For instance, Holzman's measures [5]. See in this regard the discussion by Garvy [2].

5. See Grandmont [3] for details.

6. Similar specifications have been used for instance by Benassy [1] and Malinvaud [8].

7. This section owes a gread deal to this provocative discussion of Portes [11].

8. The case where planned supply exceeds consumer demand is extremely unlikely and is not considered here.

9. This will be shown in section 4.

10. See [5], page 170.

11. As Garvy [2] notes, "The term "inflation" is banned from the Soviet economy in relation to the domestic economy".

12. Specifically [13], as well as the date cited in [6].

13. Since the model does not distinguish between per capita and aggregate figures, all data are expressed as aggregates.

14. Data is available on the state share in GNP. Pryor [12] finds that this share falls from 30 % in 1956 to 27 % in 1962. Soviet data for the period 1965-1975 show this share between 24 and 25 %.

15. As Pickersgill [9] notes, bonds are also available to consumers. For a variety of reasons, mainly historical, bond holdings are miniscule in comparison to savings deposits. The interest on either of these assets is nominal.

16. As presented in [2], p. 180 and [10]. The present work differs somewhat from the latter reference's interpretation.

17. See [7], chapter 7 for a detailed examination of these market varieties.

18. Pickersgill [9] suggests the ratio of savings deposits to currency holdings is 1:1 in 1955, and falling there after, Katsenelinboigen [7] estimates this ratio at 4:1 in 1975, which is consistent with the hypothesized growth rate.

19. Holzman's indicator $m_1$ has been fairly stable, as the data in [6] show.

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