Centro de Estudios Económicos
El Colegio de México, A.C.
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DOCUMENTO DE TRABAJO

Núm. III - 1983

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December 1983

An earlier version of this paper was presented at the IV Latin American Congress of the Econometric Society in Santiago de Chile (19-22 July 1983). I want to thank Amit Bhaduri, Susanne Bertsche, Herminio Blanco, Michael Bruno and Joseph Persky for their usefull comments. All remaining errors are unfortunately not for them to share. All calculations were carried out by Gi-Yu Lin at the University of Illinois at Chicago Computer Center.

ABSTRACT

Undesired business inventory accumulation creates financial problems for the firm that gets stuck with it. Research at the microeconomic level has analyzed the distribution across firms of the burden of the "harships", but the macroeconomic implications of such unexpected movements are rarely, if ever, considered. True, almost any comparative static model acknowledges that inventories accumulate (decumulate) if sales are smaller (bigger) than production. But, the financial pressures that appear when the flow of cash is not enough to cover contractual agreements, are usually swept under the rug of "capital losses and distributional phenomena for the economy as a whole".

The problem is reinforced by the National Income Accounts procedures of the U.S. Department of Commerce which over estimate accrued profits in a recession, by calculating them as a residual from sales and including inventory accumulation at market prices as part of it. This paper argues that the financial implications of this realization problem ought to be explicity included in our theoretical considerations as well as on empirical work.

RESUMEN

La acumulación no deseada de inventarios crea problemas financieros para la empresa que los padece. Investigación microeconómica ha permitido analizar la distribución de esta carga sobre diferentes empresas pero las implicaciones macroeconómicas de estos cambios inesperados se consideran rara vez. Ciertamente casi cualquier modelo estático comparativo reconoce que los inventorios se acumulan (decumulan) si las ventas son menores (mayores) que la producción. Pero las presiones financieras que aparecen cuando el flujo de efectivo no alcanza para cubrir las obligaciones contractuales, se incluyen generalmente en el apartado "pérdidas de capital y problemas distributivos para la economía como un todo".

El problema se ve reforzado por el método usual para construir las Cuentas Nacionales que sobre estiman las ganancias en una recesión al calcularlas como el residuo entre ventas y costos e incluir la acumulación de inventarios en aquellos evaluados a precios de mercado. Este trabajo arguye que las implicaciones financieras de este problema de realización deberían ser incluidas explícitament en nuestros considerandos teóricos y en nuestras estimaciones empíricas.

ABSTRACT

Undesired business inventory accumulation creates financial problems for the firm that gets stuck wit it. Research at the microeconomic level has analyzed the distribution across firms of the burden of the "harships", but the macroeconomic implications of such unexpected movements are rarely, if ever, considered. True, almost any comparative static model acknowledges that inventories accumulate (decumulate) if sales are smaller (bigger) than production. But, the financial pressures that appear when the flow of cash is not enough to cover contractual agreements, are usually swept under the rug of "capital losses and distributional phenomena for the economy as a whole".

The problem is reinforced by the National Income Accounts procedures of the U.S. Department of Commerce which over estimate accrued profits in a recession, by calculating them as a residual from sales and including inventory accumulation at market prices as part of it. This paper argues that the financial implications of this realization problem ought to be explicity included in our theoretical considerations as well as on empirical work.

Introduction

The unwanted accumulation of inventories creates problems for the firm that gets stuck with them: financial strains develop, production programs are cut back, profits decrease and bankrupcy (or merger) proceedings may start. Research at the microeconomic level has analyzed the distribution across firms of the burden of the "harships" but the macroeconomic implications of such unexpected movements are rarely if ever considered. True, almost any comparative static model acknowledges that inventories accumulate (decumulate) if aggregate demand is smaller (bigger) than aggregate supply. But the financial pressures that appear when the flow of cash is not enough to cover contractual agreements, are usually swept under the rug of "capital losses and distributional phenomena for the economy as a whole".

The problem is reinforced by the National Income Accounts procedures of the U.S. Department of Commerce which tend to over (under) estimate accrued profits in a recession (expansion), by calculating them as the residual from sales and including inventory accumulation at cost as part of them.

This paper argues that the financial implications of this realization problem ought to be explicitly included in our theoretical considerations as well as our empirical work. In the second part I look at a stylized firm to diferentiate accrued profits from potential profits. In the third I explore some macroeconomic implications of such an observation. I arque that Say's Law, damaged as it was by the introduction of money in a barter economy (the only one for which it is valid[1]), takes a second blow. In the fourth I review the way the U.S. Department of Commerce assembles the National Income Accounts. In the fifth I present some empirical estimates of undesired inventory accumulation and compare them to profit figures to highlight my main point. I include a few concluding remarks in the last part.

II THE PROBLEM

In the case of a firm which sells what it intended to[2], there is little use differentiating between potential and accrued income. It the firm is efficient, the generated cash flow should cover contractual payments and leave a residual for depreciation and profits[3]. If, on the contrary, a firm is systematically unable to meet its sales targets, it will be forced to accumulate inventories which will imply a financial burden. Its ability to meet contractual obligations[4] (and hence to surwive) will be determined by actual sales.

Accounting at the firm level distinguishes between the current account which reflects the cost of goods sold, and the capital account where inventory accumulation is shown. Inventory accumulation is usually counted at its book value, that is, at its cost of production[5]. The profit figure included in the balance sheet is the proft realized on actual sales; cash flow figures have to be reconstructed when necessary. While there is always a problem in assigning costs to production (as opposed to inventory accumulation), the firm which unwantedly accumulates inventories receives its "residual" in the form of inventories which should not be valued at market price since they did not sell. If the firm could distribute dividends in the form of warehouse receipts and if it could accumulate its depreciation allowance in commodities, the cash flow category would be of little help. It has been said however, that money exchanges for goods (often), goods exchange for money (as often) but that in a monetary economy goods do not exchange for goods. A firm which gets stuck with inventories has a problem liquifying its assets (inventories).

At the microeconomic level the correspondence between equilibrium in the goods market and the financial position of a firm is transparent: if sales targets are not met, funds frozen in inventories are unavailable to finance production and the purchases it requires.

In the other world, Ji the elder
will still make wine.
But, who will he sell it to if
Li Bo is not there?
Li Bo (701 - 762 AC)

III LI BO's QUANDARY

At the macro level, the financial implication of disequilibrium in the goods market are more difficult to trace. Certainly, most models impose the restriction that markets are in equilibrium only when savings equals investment. But rarely do they acknowledges that realized sales in one market bind the seller's income, and hence its ability to purchase other commodities[6]. This short poem by one of the two most important chinese poets of the Tang period (618-906AC) is the earliest indication of concern for excess supply problems I have found, and a far humbler stance than Jean Baptiste Say's.

The neoclassical synthesis has arqued that in general, both interest rates and income will change to induce equality between aggregate supply and aggregate demand. Implicitly assuming there is no fallacy of composition, the issue is thought to be which mechanism will better parcel out existing income amongst different commodities (present and future). Since

income is supposed to be sufficient to repurchase output, because a dollar worth of production generates a dollar worth of income[7], debate centers around the inelasticities of the relevant schedules. As Say argued: if every seller is a buyer and every saver an investor, all output produced is decomposable in incomes which are all spent. Imperfection may momentarily disturb the gigantic auctioneering process necessary to reconcile the disjointed decisions of descentralized producing units, but since "supply creates its own demand" there can be no generalized glut in the economy[8].

That intuition has supposedly been "confirmed" by more sophisticated models that incorporate saving, price variability, a foreign sector, uncertainty and the financial structure[9]. It is argued that the exchange between commodities and money is clearly an exchange of equivalents. Since all market transactions are symmetric, excess supply disruptions have to be short lived and caused by inflexibilities which interfere with the reallocation of income necessary to induce the proper purchasing structure.

What is missing from those explanations are the capital losses implicit in undesired inventory accumulation. In a monetary economy, the owner of a steel mill cannot exchange its unwanted inventories for the unwanted inventories of a car manufacturer. It is not true that in disequilibrium there is enough income around to purchase output back. In a "notional"

sense there is; but not in a way that allows transactions to be carried out so as to reach equilibrium. This disfunction is more profound than just a mismatch between available purchasing power (including saving) and products (including investment). In a multisector economy, money introduces an irreversible discontinuity which makes commodities non equivalent and hence congeals the financial resources and the incomes latent in them.

That discontinuity becomes operationally relevant when it is difficult to exchange goods for money. The accumulation of unwanted inventories spreads through the economy not only through industrial backward linkages (decreased demand for inputs) but also through the financial system which witnesses an increasing demand on its liquid resources. When there is a contraction of monetary aggregates, the unequal access to credit strengthens those firms which have "better relations with banks". While most macro models do not consider it their task to explain large financial takeovers at the bottom of a recession, there is an important process of capital revaluation and scrapping which takes place in every recession and which interferes with the attempts to restablish flow equilibria. Unsaleable inventories are an obstacle to recovery that is not caused by an inappropriate intertemporal maximization strategy. There will not be enough income to repurchase output unless there is an exact match between capital losses on the product and income sides[10]. It the owners of steel

mills were willing to increase their consumption of steel (now that its implicit price, the shadow cost of inventories, has decreased) to the point where its excess supply vanished, their profits would materialize, and the demand for inputs would remain the same, now that unwanted inventories have disappeared through "revaluation". Obviously any arrangement amongst n sectors would produce the same result. But in a multisector economy which produces non fungible commodities whose exchange is mediated through money, there is not enough realized (cash flow) income to purchase production back.

The presence of money hoards and/or financial intermediaries does not change this basic point; they just displace the symptoms of the malady. Sectoral imbalances (in the form of unwanted inventories) can hardly be solved by deflation which increases the real value of assets, and is hence supposed to provide more purchasing power. The needed revaluation of stocks (real and nominal) requires relative prices changes that are hindered by the immobilization of income and of financial resources in the form of unsold commodities. There is a growing literature[11] which refuses to ignore this point but its work is impaired by the way National Income Accounts are constructed.

IV THE DEPARTMENT'S OF COMMERCE PROCEDURE

The Department of Commerce keeps two sets of accounts: a product account that records all market sales of final goods and services, and an income account that lists all the charges against that production: the incomes it generates. "In principle, the sum of these charges should numerically equal the value of Gross National Product"[12] because all costs are reduceable to incomes. When sales plans are realized, profits can be likened to a cost since they constitute the income of the owners of the factors of production. In a dynamic economy, where undesired inventory accumulation occurs, thing's look very different. In practice, the income accounts record the contractual payments made whether output is sold or not. Goods which were produced but not sold increase the income of the factors of production paid contractually, thereby introducing a wedge between the two sets of accounts kept by the US Department of Commerce.

To reconcile those two figures, and to obtain profits as "the residual of sales and costs", two operations are carried out. First, "inventory change (is)... entered on the right side of the accounts to convert sales into a measure of production"[13]. Actually what gets include "in the Gross National Product, (is)... the physical volume change in inventories valued at the <u>average price</u> during the period".[14] Secondly "the excess of this measure over the book value change in inventories represents the

Inventory Value Adjustment. This adjustment is added to the business-income components of national income and secures measures of earnings from current production consistent with the treatment of inventories in the Gross National Product".(14) The reconciliation, while complicated, seems to have been sucessfull. On the product side it added an estimate of inventory changes so that the contractual payments made on account of unsold production are not excluded. On the income side it included the IVA so that the difference between the cost of production (which is the sum of contractual payments) and the market price (which is the value at which inventory accumulation gets computed) gets recorded as a capital gain or loss.(15)

Certainly the IVA allows us to differentiate effectively between profits that accrue to the firm because of its sales, and those that reflect capital gains due to inventory speculation (desired or not). Nonetheless, it is impotent to show the financial constraint on corporate behavior since it does not present an accurate cash flow picture: it assumes that inventories are "as good as money" (by evaluating them at market prices) when we in fact know they could not be sold at that price. That is why the National Income Accounts could show positive profits while the corporate sector could be close to bankrupcy.

Suppose for example that, as in Figure I 250 schmoos were produced but only 180 of them were sold at $ 1 each. The rest went to inventory accumulation. Let us apply the Department of Commerce methodology to this situation. Contractual payments (part of National Income) amount to $200 while actual final sales (GNP) are $180. To resolve this discrepancy we nedd to do two things. First realize that inventories grew by 70 schmoos, value them "at their market price" of $1 and add that estimate to final sales "to obtain a production figure". The GNP estimate becomes $250 ($180 + 70 x $1). Second we need to estimate profits to add them to the $200 as part of National Income. Profits are the residual of production and costs.: $250 - ($200 + $30) = $20. Et voila! Since National Income is the sum of all forms of income it now equals NNP: $200 + $20 = $220.

FIGURE I

National Income Accounts of Fungiland

Cost of goods produced		Sales	$ 180
Intermediate inputs	$ 100		
Wages & Salaries	$ 80		
Interest Payments	$ 20		
Total Contractual payments	$ 200		
"Depreciation"(16)	$ 30		
"Profits"(16)	$ 20		
Net Cash Flow	- $ 20		
Capital Consumption Allowance Shortage	- $ 30		
Inventory accumulation	$ 70		

Notice that I assumed no technical change, no inflation and in general no reason for book values to differ from market prices and hence the IVA is zero.(17) Our accounts show an economy-wide profit of $20. As should be obvious however, it is a misleading figure: it is in fact composed of a cash outflow of -$20 and an inventory accumulation of $70. Actually the firms cannot meet their contractual obligations and since schmoos in a warehouse are of no use, they need an outside source of financing or they will face bankrupcy. The source of the problem is the valuation of inventory accumulation at market prices. Why would one object to a system of accounting that values inventory accumulation at their "average price of production"? Precisely because if there is unwanted inventory accumulation it is <u>because</u> the market price they were offered at was too high. It is hence incorrect to implicity assign to them the very price at which we know they could not be sold at.

Let me recapitulate: accounting at the firm's level is quite transparent about the difference between cash flow profits and unrealized profits imbedded in undesired inventory accumulation.(18) This simplicity is lost in the U.S. Department of Commerce methodology which values inventories at "market prices" without regard for their saleability. Far from arguing that the shadow price of undesired inventory accumulation is zero, I want to insist on the fact that in a monetary economy there is no

accrued income corresponding to them. Hence we should either correct the National Income Accounts to provide us with cash flow estimates of income, or we should acknowledge they refer to an idealized situation in which unwanted stocks do not exist. Similarly, our output measurements (GNP, NNP) are also marred by the same problem, since they overestimate the production for inventories.

V UNDESIRED INVENTORY ACCUMULATION. A FIRST ESTIMATE

To provide some empirical support to this discussion I tried to get a first estimate of undesired inventory accumulation. Instead of using an intertemporal maximization model of the demand for inventories, as was done by Blanco (1978) for other forms of investment, I used a more "ad hoc" model developed by Maccini and Rossana (1980), (1981). The latter seemed sophisticated enough for my purposes without being too cumbersome. Indeed it carefully distinguishes between the desired level of investment in inventories, which depends on the "normal levels" of some exogenous variables, and the adjustment process of actual to desired inventories. Hence it allows actual inventories to quickly adjust to a slow moving target. This is an important property since most inventory changes account for only a couple of days worth of production. Feldstein and Auerbach (1976) sorely complained about the very low speeds of adjustment they estimated.

I take the estimated level of inventory investment to be its desired level, and the residual error term to be its unforeseen component. Two equations describe the model:[19]

$$(1) \quad \Delta \ln I_t = \lambda \ (\ln I_t^* - \ln I_{t-1})$$

with $I_t \equiv$ Inventory level at time t

and * indicating desired levels

and

$$(2) \quad \ln I_t^* = k + a \ln S_t^{e*} + b \ln W_t^{e*} + c \ln N_t^{e*}$$

with $S_t \equiv$ Sales at time t

$W_t \equiv$ unit labour costs at time t

$N_t \equiv$ unit non-labour costs at time t

and e indicating expected values

The first equation is a flexible accelerator adjustment model between actual and desired inventory levels, while the second is the functional form of the demand for inventories. The basic estimating equation can easily be obtained by specifying that the expected normal levels of S_t, W_t and N_t are a distributed lag function of their own past levels:

$$(3) \quad \Delta \ln I_t = c - \lambda \ln I_{t-1} + \sum_{i=1}^{L_1} \alpha_i \ln S_{t-1} + \sum_{i=1}^{L_2} \beta_i \ln W_{t-i} + \sum_{i=1}^{L_3} \gamma_i \ln N_{t-i} + \varepsilon_t$$

where L_1, L_2 and L_3 need not be equal, and ε_t is an error term which represents unforeseen inventory accumulation. Standard microeconomic theory imposes the following restrictions:

$0 < \lambda \leq 1$: the speed of adjustment is positive and less than or equal to instantaneous.

$\sum_i \alpha_i \geq 0$: more inventories are needed when sales grow.

$\sum_i \beta_i \leq 0$ and $\sum_i \gamma_i \leq 0$: it is expensive to build inventories. Hence, as their production costs increase, investment in them will decrease.

The lag polinominals were estimated with the Almon technique which searches over different lag specifications while minimizing the standard error of estimate and saving degrees of freedom.

Estimation was carried out on quarterly US data from the NBER bank for the 1959I - 1980I at four levels of aggregation: Manufacturing, Wholesale trade, Retail trade and the US economy as a whole. Data sources and characteristics are described in Appendix A. As did Maccini and Rossana, I estimated five different version of equation (3) numbered I though V:

- I uses four lagged values of sales and imposes $\sum_i \beta_i = \sum_i \gamma_i = 0$. It is a pedestrian version of the flexible accelerator model in which inventories depend exclusively on sales. It forces the normal expected level of sales to be determined by only four of its lagged values and hence it biases downward the estimated speed of adjustment. Indeed it obliges what economic intuition would describe as "a fast adjustment to a slowly moving target" to look like "a slow adjustment to a quickly moving target".

- II corrects this deficiency by allowing the lenght of the $\sum_i \alpha_i$ polinominal to be optimally chosen but here too $\sum_i \beta_i = \sum_i \gamma_i = 0$
- III extends the Almon technique to $\sum_i \beta_i$, but maintains $\sum_i \gamma_i = 0$
- IV uses the Almon method on $\sum_i \alpha_i$ and $\sum_i \gamma_i$ with $\sum_i \beta_i = 0$
- and finally V is the most general model: $\sum_i \alpha_i$, $\sum_i \beta_i$ and $\sum_i \gamma_i$ are all estimated with the same technique.

Ordinary Least Squares estimation yielded low Durbin Watson statistics which should be taken with a grain of salt since a lagged dependent variable is used as a regressor. Taylor and Wilson have argued, however, that in large samples the usual test performs reasonably well. I hence took those results to indicate that the hypothesis of first orden autocorrelation could not be rejected and used the Cochrane Orcutt iterative procedure to improve estimation efficiency. When estimating the distributed lags, I searched over the degree of the polynomial and the lag length to minimize the standard error of regression. The results seemed fairly robust and only the best one is included in each case. Regression results are presented in Tables I-IV and in all cases the values of the Durbin Watson statistic allow us to reject the hypothesis that the residuals are AR(1) at the 1% confidence level.

The hypothesis that $\lambda \geq 0$ cannot be rejected at the 1% confidence level in any of the 20 cases. Actually in all but four of the regressions, we could not reject the hypothesis that $\lambda > 0$ at the 1% level. The corresponding adjustment speeds range from 24.44 for Manufacturing_I to 1.01 quarters for Retail Trade_I. Parameter estimates from specification I are four times bigger than the corresponding ones from specification V. The estimates from the last specification imply that on average inventories adjust to their desired levels in a couple quarters. The rest of the good new is that in all cases we cannot reject the hypothesis that the $\sum_i \hat{\alpha}_i$ are non negative at the 1% confidence level. Unfortunately only six of the eight estimates of $\sum_i \hat{\gamma}_i$ and half of the $\sum_i \hat{\beta}_i$ have the correct sign.

Goodness of fit increases as we go from specification I to specification I: corrected R^2 increase and standard errors of regression decrease. The models better reflects what happens in Manufacturing (which accounts for 40% of total inventories), and the US as a whole, than what happens in Trade. Overall results seem to replicate Maccini's and Rossana's (1981) paper even though I get a better goodness of fit and somewhat lower parameter estimates.

My main objetive however was to estimate undesired inventory accumulation, ie the regression residuals. Having tried to correct for what looked like autocorrelation of the

first degree of the residuals, it is unclear that the whitened residuals should be prefered to the colored ones. Since I could see no reason to prefer the former over the latter I recalculated them both by computing:

$$(4) \quad \hat{\rho}\, U_{t-1} + \varepsilon_t = I_t - \hat{I}_t$$

where $\hat{I}_t$ was obtained using the most efficient parameter estimates. Given the form of equation (3) however, those are growth rates of real levels; they had to be reconverted to produce the current dollar amounts shown in Table VI for the 1970I - 1980I period[20] and for specification V. The first two columns show cash flow and before tax profit figures for the corporate sector as a whole, while the next four are the empirical counter parts to the theoretical arguments presented in Part II on this paper. The next to the last column, labelled "Manufacturing and Trade" lists:

$$I_I + I_{II+III} \quad \text{if they are both negative}$$

$$\text{or Max} \quad [I_I,\ I_{II+III},\ I_I + I_{II+III}] \quad \text{otherwise.}$$

Those are the total financial claims placed on the system by warehouses that are getting filled up. To just add I_I and I_{II+III} with no regard for their sign would have impled that firms with unexpected inventory decreases would have financed, with their unplanned cash flow, the unexpected inventory accumulation of other firms. Without prejudging the efficiency of the financial

structure in transfering resources form one sector to another, the phenomenon I am interested in is eminently a short run one; those numbers provide an alternative to the last column.

While the numbers are not giganic compared to total profits, they sometimes place real strains on the financial structure. In 1974_{III} (the quarter before the trough of the 1975 recession) and again in 1978_{II} and 1979_{II} 10, even 20 billion dollars had to be found lest firms would go bankrupt. We should remember that total dividends amounted to 37.9 billion dollars in the third quarter of 1979 and to 21.4 billions for 1974; total residential construction in 1974 was 54.8 billion dollars. 20 billion dollars can have be a sizeable financial impact!

Sometimes however, the number are very small, and some other times they entail "unexpected cash inflows". Since my argument is that in crisis situations, and only then, unwanted inventory accumulation may cause very serious damage to some sectors, those occurences are of litle concern. The disagregation shown in Table V indicates that only 20% of the time did both sectors accumulate unplanned inventories simultaneously; 45% of the time they moved asinchronously sometimes creating powerfull tensions: in 1978_{II} the Manufacturing sector lost 5.86 billion dollars of inventories while the Trade sector gained 8.81 billion. This is far from being a smooth growth pattern.

Finally, as suspected, unexpected inventories move countercyclically: they accumulate in a recession, when sales are falling and hence creating more financial pressure, and decumulate in an expansion when "easy credit" available.

CONCLUSION

This paper has tried to explore the macroeconomic implications of undesired inventory accumulation and to give an estimate of the financial strains they entail for the economy as a whole. It argued that, in a multisectoral monetary economy, there isn't enough income to purchase output back when warehouses fill up. In that case the invisible hand may be hard pressed to gently nudge the economy back to equilibrium. Furthermore the observation that most inventory changes are equivalent to a couple days worth of production lends credibility to quantity adjustment since firms are more likely to change production schedules monthly than they are to change prices. A 10% change in work schedules can adjust inventories worth two days of production, in a month. The empirical work supports this casual inference by estimating that it takes between two or three quarters for actual inventories to reach their desired level. As for the financial burden of accumulating inventories it was calculated that they represented 35% of residential construction in the fourth quarter of 1974.

Table I

Estimation results with Cochrane - Orcutt correction

Manufacturing (1959I-1980I)

	c	λ	Σαi	Σβi	Σγi	$\bar{R}^2$	Se	$\hat{\rho}$
I	0.897 (2.6633)	-.1358** (-4.2661)	.1366 (1.9641)			.6545	.0052	.5487 (5.8709)
II	.1382 (2.1218)	-.2227** (-4.2602)	.2241 (24)** (4.2490)			.7748	.0043	.4514 (3.9182)
III	-.4172 (-2.9352)	-.1510** (-2.7676)	.2629 (24)** (3.5335)	.0180 (20) (1.0319)		.8043	.0041	.1157 (.9019)
IV	.4392 (2.8581)	-.6548** (-5.0957)	.7599 (18)** (4.5943)		-.0879 (10)** (-1.7719)	.7043	.0049	.8687 (14.2504)
V	-.3350 (-2.5429)	-.2947** (-3.6582)	.4189 (24)** (4.5512)	-.0831 (18) (-.9494)	.0974 (10) (1.2374)	.8472	.0036	-.0334 (-.2586)

$\bar{R}^2$ is corrected for degrees of freedom; Se is the standard error of the regression; $\hat{\rho}$ the estimate of the autocorrelation factor; The numbers in parenthesis below the coefficient are the t-statistics.

The numbers in brakets above some coefficients are the number of estimated lags with the Almon technique.

** Significant at the 1% confidence level.

Table II

Estimation results with Cochrane - Orcutt correction

Wholesale Trade (1967I-1980I)

	c	λ	Σαi	Σβi	Σγi	$\bar{R}^2$	Se	$\hat{\rho}$
I	.0225 (.6174)	-.0409 (-.6860)	.0412 (.2030)			.3258	.0102	-.0096 (-.0669)
II	.0324 (.4724)	-.1120 (-1.046)	.1195 (12) (.9362)			.3045	.0112	.1370 (.8744)
III	.1260 (1.1152)	-.6643*** (-3.2783)	.3431 (12) (2.0230)	.2602 (10)** (2.9886)		.4159	.0103	.3392 (2.2806)
IV	.0781 (1.0088)	-.6439** (-3.5974)	.3979 (9)** (2.7857)		.2135 (5)** (3.3762)	.4219	.0099	.3635 (2.5584)
V	.3489 (2.0559)	-.7527** (-3.8183)	.2189 (12) (1.1388)	-.2257 (9) (-.9528)	.5930 (5) (2.2775)	.4649	.0099	.3854 (2.6415)

The same conventions apply for this table as for table I.

Table III

Estimation results with Cochrane - Orcutt correction

Retail trade (1967I-1980I)

	c	λ	Σαi	Σβi	Σγi	$\bar{R}^2$	Se	β̂
I	.7688 (3.4690)	-.9881** (-6.2820)	.8710 (3.2997)			.3699	.0132	.7118 (7.0113)
II	.4215 (2.9870)	-.5062** (-3.2964)	.4362(12)** (3.0766)			.3979	.0136	.1184 (.7541)
III	.3000 (2.2429)	-.4541** (-3.1169)	.3138(12) (2.2695)	.09191(10) (1.7854)		.4394	.0132	.2314 (-1.5046)
IV	.4353 (3.9161)	-.3284** (-2.7344)	.1582(9) (1.0929)		.0575(5) (1.4230)	.4400	.0130	-.1333 (-.8817)
V	1.0158 (4.4606)	-.6406** (-4.5386)	.0405(12) (2.2620)	.3328(9) (2.3304)	-.0440(5) (-.2928)	.6161	.0109	-.4032 (-2.7869)

The same conventions apply for this table as for table I.

Table IV

Estimation results with Cochrane - Orcutt correction

The whole Economy (1959I-1980I)

	c	λ	Σαi	Σβi	Σγi	$\bar{R}^2$	Se	β
I	.1800 (4.1785)	-.1442** (-4.1053)	.1309 (1.5210)			.5615	.0043	.2878 (2.6876)
II	.4049 (3.6300)	-.2563** (-3.1698)	.2155 (24)** (2.9133)			.6095	.0043	.3211 (2.6267)
III	.0566 (.2049)	-.1334 (-1.3062)	.1416 (24) (1.5292)	.0062 (20) (.3583)		.6161	.0043	.1238 (.9667)
IV	.1189 (1.2708)	-.1636 (-2.2129)	.2200 (18)** (2.9836)		-.0473 (10)** (-4.9105)	.6724	.0038	.0016 (.0129)
V	-.2793 (-1.4741)	-.3894** (-3.8741)	.6135 (24)** (4.7520)	.2060 (18)** (4.3916)	-.2743 (10)** (-4.4756)	.7475	.0035	-.1109 (-.8640)

The same conventions apply for this table as for table I.

Table V

Speed of adjustment of actual to desired inventories
(# of quarters)

Sector \ Specification	I	II	III	IV	V
Manufacturing	7.36	4.49	6.62	1.53	3.39
Wholesale trade	24.44	8.93	1.50	1.55	1.34
Retail trade	1.01	1.97	2.20	3.04	1.56
The whole economy	6.93	3.90	7.50	6.11	2.57

Table VI

Profits, Cash Flow and Unexpected Inventory Accumulation

(Billion current dollars
on an anual basis)

	Cash Flow	Before tax Profits	Unexpected Inventory Accumulation			
			Manufacturing	Wholesale and Retail Trade	Manufacturing* and Trade	The Economy as a Whole
1970 I	70.1	68.4	- .51	- 9.81	- 10.32	- 1.85
	70.1	68.1	- 1.94	- 3.48	- 5.42	- 1.04
	72.1	69.3	- .80	- .51	- 1.31	- .54
	70.6	64.9	.78	- 2.02	- .78	- 3.48
1971 I	76.4	73.9	- 1.24	3.14	3.14	1.29
	80.5	76.1	2.42	.75	3.17	4.44
	84.0	79.4	2.07	3.97	3.97	1.37
	87.8	80.2	.23	- .63	.23	.79
1972 I	91.8	86.2	- .16	- 2.84	- 3.00	1.15
	96.6	87.9	2.24	- 1.56	2.24	2.42
	98.3	91.4	3.37	- 1.16	3.37	1.40
	105.0	99.8	- 1.00	1.96	1.96	- 2.21
1973 I	111.1	108.8	- .70	- .78	- 1.48	- 2.63
	113.6	111.1	- 2.28	- 2.81	- 5.09	- 1.92
	111.3	106.5	- 2.21	- 4.44	- 6.66	- 5.57
	116.1	109.4	.05	3.49	3.54	- 5.51
1974 I	119.6	110.5	1.91	.60	2.51	- 2.04
	122.6	117.3	.15	2.67	2.82	- 1.55
	132.2	128.7	- 2.01	- 1.85	- 3.86	- .19
	126.4	112.9	4.08	9.33	13.41	19.07
1975 I	114.1	94.6	- .28	- 2.83	- 3.11	- 8.06
	121.7	103.6	- 2.60	- 6.03	- 8.63	-11.75
	136.2	127.6	.80	6.19	6.99	7.25
	139.7	131.3	- 1.01	- 6.89	- 7.90	- 7.57
1976 I	150.0	146.1	- .05	4.04	4.04	4.83
	150.1	148.5	1.70	- .56	1.70	4.78
	152.6	148.5	- .38	- .71	- 1.09	.16
	154.5	147.8	- 4.17	.01	.01	-10.70
1977 I	162.5	158.7	- 1.48	1.01	1.01	- .13
	170.5	166.5	3.60	.04	3.64	2.75
	176.2	170.2	- .31	2.35	2.35	6.36
	177.6	173.9	- 2.45	- 5.21	- 7.66	- 3.39
1978 I	178.1	167.4	3.83	- .97	3.83	4.03
	195.5	196.1	2.75	8.12	10.86	3.01
	197.3	201.9	- 1.63	.33	.33	- 3.04
	205.7	217.8	- 5.86	8.81	8.81	- 7.19

Table VI (continued)

1979 I	216.0	221.4	1.84	2.76	4.60	- 6.67
	217.3	216.2	4.04	- 1.65	4.04	10.52
	228.3	226.5	- 2.70	1.06	1.06	3.32
	229.6	229.5	- .21	- 6.21	- 6.42	1.78
1980 I	238.8	244.4	2.54	-10.11	2.54	- 4.93

* This column is calculated in the following way: if the inventories changes in retail and manufacturing are both negative, it is just their sum. If not it is the Max $\left[I_I, I_{II+III}, I_I+I_{II+III}\right]$

See the text for an explanation.

Sources: Columns I and II Economic Report of the President.

Columns III - VI Own calculations, see the text for an explanation.

APPENDIX A

Definitions and Sources of Data.

All data are taken from the National Bureau for Economic Research data bank and they cover the 1959I-1980I period. The series numbers and -- frequency are included for easy reference.

Series #	Variable Name	Description	Frequency
96		Net cash flow, corporate sector	"
462		Corporate profit, before tax	"
483		Corporate profits, with inventory value adjustment before capital consumption allowances. Wholesale & Retail trade	"
486	I_{IV}	Total inventories	"
487		Total inventories (constant dollars)	"
491	I_{I}	Manufacturing inventories (constant dollars)	"
499	I_{III}	Retail trade inventories	"
500		Retail trade inventories (constant dollars)	"
510	I_{II}	Wholesale trade inventories	"
511		Wholesale trade inventories (constant dollars)	"
871	W_{II}, W_{III}	Unit labor costs. Private business sector all persons	"
880	N_{II}, N_{III}	Unit non-labor payments. Private business sector all persons.	"
881	N_{I}	Unit non-labor payments. Non farm business sector.	"

Series #	Variable Name	Descripción	Freguency
895	W_{IV}	Unit labor costs. Non financial corporations	"
896	W_I	Unit labor costs. Manufacturing	"
914	N_{IV}	Unit non-labor costs. Non corporations	
924	S_I	Manufacturing total sales (constant dollars)	"
925	S_{IV}	Manufacturing and trade total sales (constant dollars)	"
1028	S_{III}	Retail sales (constant dollars)	"
1031	S_{II}	Merchant wholesales sales (constant dollars)	"

Notice that the following conventions have been adopted

I_i = Inventories of sector i

S_i = Sales of sector i

W_i = Unit labor cost of sector i

N_i = Unit non-labor payments of sector i

And there are four sectors

I	Manufacturing
II	Wholesale trade
III	Retail trade
IV	Total

Footnotes

(1) See Patinkin (1965) p. 193 - 195.

(2) This paper does not consider investment in desired inventory accumulation.

(3) Unincumbered by legal or accounting restrictions I consider depreciation a potential sources of financial help in a desperate situation. It is a form of disinvestment mentioned in discussions about sectoral capital mobility.

(4) Intermediate inputs, wages, interest pagments, etc...

(5) The voluminous literature on LIFO against FIFO accounting sheds little light on the macroeconomic implications of the realization problem.

(6) One sector models are uneasy explaining what happens in the contrary case since the structure of the model implicitly allows inventories to be directly consumed or invested, putty-clay models notwithstanching.

(7) See Heilbronner and Thurow (1981) Chapter IX for the simplest explanation.

(8) See Sowell (1972).

(9) See Hick (1973), Hansen (1953), Dornbush and Fisher (1978), Dornbusch (1980) and Sargent (1979) as possible examples.

(10) I think this is just a way of rephrasing Clower's (1965) point.

(11) See for example Clower (1965), Leijonhufvud (1968), Barro and Grossman (1976) and Iwai (1981).

(12) See US Income and Output (1968) p. 31.

(13) idem. p. 32

(14) idem. p. 135

(15) As the Department of Commerce explains: "When negative, the IVA measures the inventory gain, and when positive the inventory loss, which arises from the fact that inventories used up in production are not valued at current replacement costs. Its affinity to capital gains and losses, which also are eliminated in calculating national income and product is readily evident". Ibidem p. 44.

(16) The quotes are necessary as the cash flows to cover these entries do not exist.

(17) "The... inventory component of GNP... is derived as the sum of the change in book values and the inventory value adjustment" Ibidem p. 98.

(18) This is not to say that inventory evaluation is a simple matter, just that the difference between accrued profits and potential profits is easy to make at the firm's level.

(19) The reader is invited to look at Maccini and Rossana's (1980) paper for the inner structure of the model. The formal structure was actually developed by Maccini in his 1978 paper. I have made no change in that structure and hence limit myself to reproducing the estimating equation rather than repeating their discussion.

(20) Given the long lag structure and the somewhat different availability of data, the period for which a complete reconstruction was posible, got considerably shortened.

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