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PAPER NO. 1069

Carry-Over Effects of Inflation

*Robert F. Sharp*  
*Valdean C. Lembke*

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August 1984

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Robert F. Sharp, Assistant Professor  
Department of Accountancy

Professor Valdean C. Lembke  
University of Iowa

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## CARRY-OVER EFFECTS OF INFLATION

ABSTRACT: Written for practicing accountants, this paper estimates the continuing effects of past inflation on conventional accounting measures after simulated stabilization of all prices. The results show that different versions of conventional accounting continue to produce data that are not comparable over time and are not comparable with each other for similar businesses. All versions of historical cost income converge with current cost income, but they require at least ten years to reach approximate equality. The LIFO method and artificially-accelerated depreciation methods continue to produce unreliable estimates of assets, shareholders' equity and return on investment -- even after all assets have been replaced at stabilized prices. These limitations apply to retailers as well as manufacturers.





## CARRY-OVER EFFECTS OF INFLATION

Several modifications in reporting the effects of changing prices will be considered this year. FASB Statement No. 33 was issued on an experimental basis in 1979, and the announced time has come for evaluating its requirements. A recent JofA article by Swanson<sup>1</sup> summarizes arguments for eliminating the historical cost/constant dollar disclosures and for improving the current cost disclosures.

Before deciding how the present disclosure requirements should be modified, however, it must first be decided whether any adjusted disclosures are needed. Two opposing arguments are noted by the FASB.<sup>2</sup> Those who favor discontinuation of adjusted disclosures argue that inflation is no longer high enough to justify further experimentation. On the other hand, those who favor continued disclosures point to the fact that the effects of inflation are cumulative. Double-digit inflation of past years will continue to affect measures of fixed assets and depreciation, to some degree, as long as fixed assets acquired in those years are still being used. At least for capital-intensive companies, those who support continuation argue that differences between adjusted disclosures and conventional disclosures would be material for many more years.

Thus far, no evidence has been available for resolving this controversy. The number of years that differences would be material has not been investigated for capital-intensive companies. Conversely, it has not been demonstrated that future differences would be immaterial for companies with relatively low investments in fixed assets (e.g., retailers vs. manufacturers).

This article provides a means of estimating differences in future disclosures that would result from past inflation. Computer simulation is

used to generate conventional disclosures and current cost disclosures for an average manufacturer and an average retailer during a future period of completely stable prices. The study includes different combinations of conventional methods, based on FIFO or LIFO for inventories and straight-line or sum-of-the-years'-digits for fixed assets. Resulting differences and their patterns of convergence over time are shown for reported income, shareholders' equity and return on investment.

The results indicate several limitations of conventional accounting that do not disappear when prices stabilize. Even with zero inflation, there continue to be diverse amounts reported when different accounting methods are used for the same firm. In addition, even when the same conventional methods are used consistently, there are problems of interpreting conventional results for a single firm over successive accounting periods. Material differences continue for at least ten years after prices stabilize, and some conventional methods produce artificial differences that never disappear.

#### Characteristics of the Simulated Firms

An average manufacturer and an average retailer were developed by analyzing the capital intensity and other characteristics of manufacturing companies and retailing companies included in the COMPUSTAT data base.<sup>3</sup> Each firm is incorporated at the end of 1960 and produces a constant physical output from 1961 to 2002. Through 1982, the manufacturer's costs and selling prices are determined by the producer price index for manufactured goods, and the retailer's prices are determined by the producer price index for finished consumer goods. Prices for 1983 through 2002 are held constant at their respective levels for December 1982.

To test effects of the choice of accounting method, each firm's activities are measured according to three versions of conventional accounting:

<u>Version</u>	<u>Inventory Method</u>	<u>Depreciation Method</u>
1	FIFO	straight-line (SL)
2	LIFO	straight-line (SL)
3	LIFO	sum of years' digits (SYD)

According to Accounting Trends and Techniques,<sup>4</sup> most firms use either FIFO or LIFO, and nearly 80 percent use SL depreciation. SYD depreciation is used in the study to approximate various accelerated depreciation methods.

The next three sections indicate the extent to which these conventional methods would approximate current cost data after prices are stabilized. Considered first are the effects of past inflation on reported income. This is followed by analyses of the effects on reported capital and the combined result of income and capital on rates of return.

#### Effects on Reported Income

Exhibit 1 presents conventional net income as a percentage of current cost income. Year 0 is based on published price indices through 1982, and years 1 through 20 approximate the results of using different conventional methods if prices had stabilized at the end of 1982. Current cost income is constant during this period. All versions of conventional income converge with current cost income in year 17, which is the year after all fixed assets have been replaced at stabilized prices.

[Insert Exhibit 1 about here.]

The rate at which conventional income converges depends primarily on the choice of conventional depreciation method.<sup>5</sup> Costs charged by SYD

depreciation are those of predominantly newer assets with higher costs, resulting in a lower reported income than when SL depreciation is used. Since inventory levels are held constant, the choice between FIFO and LIFO has negligible effect on reported income after the first year of stable prices. The only remaining difference between FIFO and LIFO is the amount charged for factory overhead (for the manufacturer), which is a relatively small difference that diminishes to zero by the seventeenth year.

Several important points can be observed in Exhibit 1. First, all versions of conventional income indicate declining profitability even though both firms have stable operations at stable prices. In contrast, current cost income has the advantage of being constant when all conditions are constant. Second, different versions of conventional income indicate different levels of profitability for the same firm. Thus it would be difficult to compare similar firms that use different conventional methods. Third, the same version of conventional income does not provide comparable measures of profitability for different firms. Because of its higher capital intensity, the manufacturer's conventional income is relatively higher than the retailer's conventional income--regardless of which combination of conventional methods is used for the comparison.

Results for the retailer also indicate that differences between conventional and adjusted income are not limited to firms with high capital intensity. Even though its capital intensity is less than half that of the manufacturer, the retailer's differences seem material to us. After five years of stable prices, conventional income with LIFO/SYD is still 24 percent higher than current cost income, and conventional income with FIFO/SL is 45 percent higher. Thus, even for firms with relatively low capital intensity, conventional methods do not produce comparable measures of profitability.

Effects on Reported Capital

Exhibit 2 presents conventional measurements of capital (shareholders' equity) as a percentage of adjusted capital based on current costs. Adjusted capital is a constant amount after prices are stabilized.

[Insert Exhibit 2 about here.]

Although the choice between FIFO and LIFO had little effect on reported income in Exhibit 1, that choice has a major effect on reported capital in Exhibit 2. FIFO inventories are based on the latest historical costs, which approximate or equal the current costs of inventory during the test period. On the other hand, LIFO inventories are based on the earliest historical costs, in this case the costs existing when the firms were formed in 1960. By undervaluing inventory, LIFO also undervalues reported capital. This difference does not disappear after prices stabilize; it will continue for as long as a firm continues to use the LIFO method.

Similarly, use of SYD depreciation causes a permanently lower amount of reported capital. SYD depreciation reduces fixed assets more quickly than SL depreciation, resulting in lower amounts for fixed assets and reported capital.

For these reasons, conventional methods also fail to provide comparability in the balance sheet. All conventional methods indicate an increasing amount of capital for a stable operating level under stable prices. In addition, different conventional methods indicate materially different levels of capital for the same firm. Again there is no comparability across methods. The additional problem in the balance sheet is that some differences do not disappear as they do in the income statement.

The least reliable methods in the balance sheet are those conventional methods that are intended to counteract inflation in the income statement.<sup>6</sup> LIFO alone causes the retailer's capital to be undervalued by 34 percent (66 percent of current cost)--even after twenty years of stable prices. With SYD and LIFO combined, the retailer's reported capital is still undervalued by 60 percent after all assets have been replaced at stabilized prices. Reported capital based on such methods would never be comparable with current costs and would never be comparable with other conventional methods.

#### Effects on Rate of Return

An overall evaluation of the preceding results can be made when reported amounts are combined to estimate a firm's rate of return on capital. Exhibit 3 presents conventional rates of return as a percentage of the adjusted rate of return based on current costs. The adjusted rate of return is a constant amount after prices are stabilized.

[Insert Exhibit 3 about here.]

As may have been anticipated from the preceding results, there is even less comparability among conventional rates of return. Overall dispersion is greater for rates of return because the conventional numerators are higher and the conventional denominators are lower than their adjusted counterparts. The combined effect is an even greater illusion of declining profitability than was indicated in Exhibit 1. (In making this comparison, note that it was necessary to have a different scale for Exhibit 3.)

These results indicate that accounting users who wish to assess rates of return from conventional data will be unable to do so for many years. FIFO/SL is the only conventional version that could serve this purpose,<sup>7</sup> and it does not approximate the adjusted rate of return until prices have been stable for

more than a decade. Even then, it will not be possible to make useful comparisons with firms using SYD depreciation and/or LIFO. While the latter methods produce a short-run advantage in assessing dollar profitability, they also produce a permanent disadvantage in assessing relative profitability. Because they permanently undervalue assets and capital, the latter methods continue to overestimate rates of return after amounts reported for income have converged with current cost income.

Again it should be noted that this causes problems for retailers as well as manufacturers. Use of LIFO alone causes the retailer's rate of return to be overstated by 51 percent after twenty years of stable prices. When SYD is used in conjunction with LIFO, the retailer's rate of return continues to be overstated, 150 percent higher than the adjusted return after all assets have been replaced at stabilized prices.

#### Improving Current Cost Measurements

At this point, it is reasonable to ask whether actual current cost disclosures would be as useful as they seem in this study. As these simulations do not allow for measurement errors, the results may overstate the case.

The answer may depend on our ability to improve present measurement techniques. For example, one of several recommendations discussed by Swanson<sup>8</sup> is to require separate determination of appropriate depreciation methods for current cost disclosures. Those disclosures would be less useful if based on unrealistic lives or artificial depreciation patterns. Another recommendation deals with cases when fixed assets become obsolete as a result of technological change. Current costs can only be approximated then, and techniques based on specific price indices may need to be improved.

On the other hand, it seems unlikely that these difficulties would cause current cost disclosures to be as misleading as disclosures based on different conventional methods. The dispersion shown for conventional measures suggests that current cost measures could contain substantial errors and still be more informative. Moreover, if future inflation rates are greater than zero, the dispersion of conventional measures will be greater than these results indicate for zero inflation.

By showing what could be achieved with perfect measurements of current costs, this study also indicates the potential benefits of improving our measurement techniques. We have made some progress since the present experiment began, and there is no reason to expect that progress has come to an end -- unless the experiment is discontinued.

### Summary

This study shows limitations of conventional accounting that will continue for many years after inflation subsides. Different versions of conventional accounting produce data that are not comparable over time and are not comparable with each other for similar businesses. All versions of conventional income converge with current cost income, but they require at least ten years to reach approximate equality. The LIFO method and artificially-accelerated depreciation methods continue to produce unreliable estimates of assets, capital and rates of return -- even after all assets have been replaced at stabilized prices. Finally, these limitations apply to retailers as well as capital-intensive firms.

These findings support the continuation of current cost disclosures. Future use of such disclosures will depend to a great extent on whether

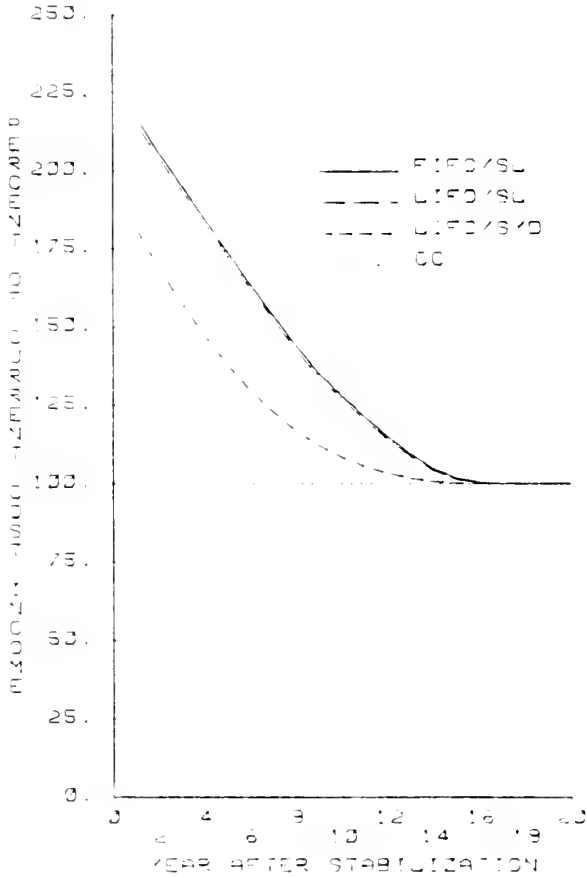


accounting users are aware of the continuing limitations of conventional data. Most of them were aware that income was inflated and assets were undervalued when inflation was high. Now that inflation has subsided, they may mistakenly assume that those problems have dwindled to insignificance. If so, they would be placing more reliance on conventional data than would be warranted. Because of this possibility, it is in the best interest of the accounting profession to see that these limitations are brought to the attention of their clients and other interested parties.

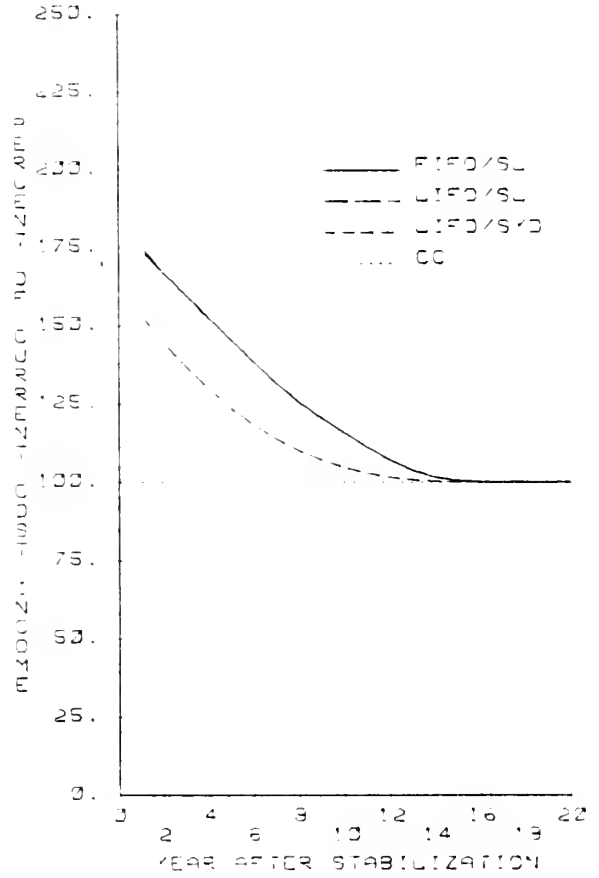
Exhibit 1

Comparison of Conventional and Current Cost Income

Manufacturer



Retailer

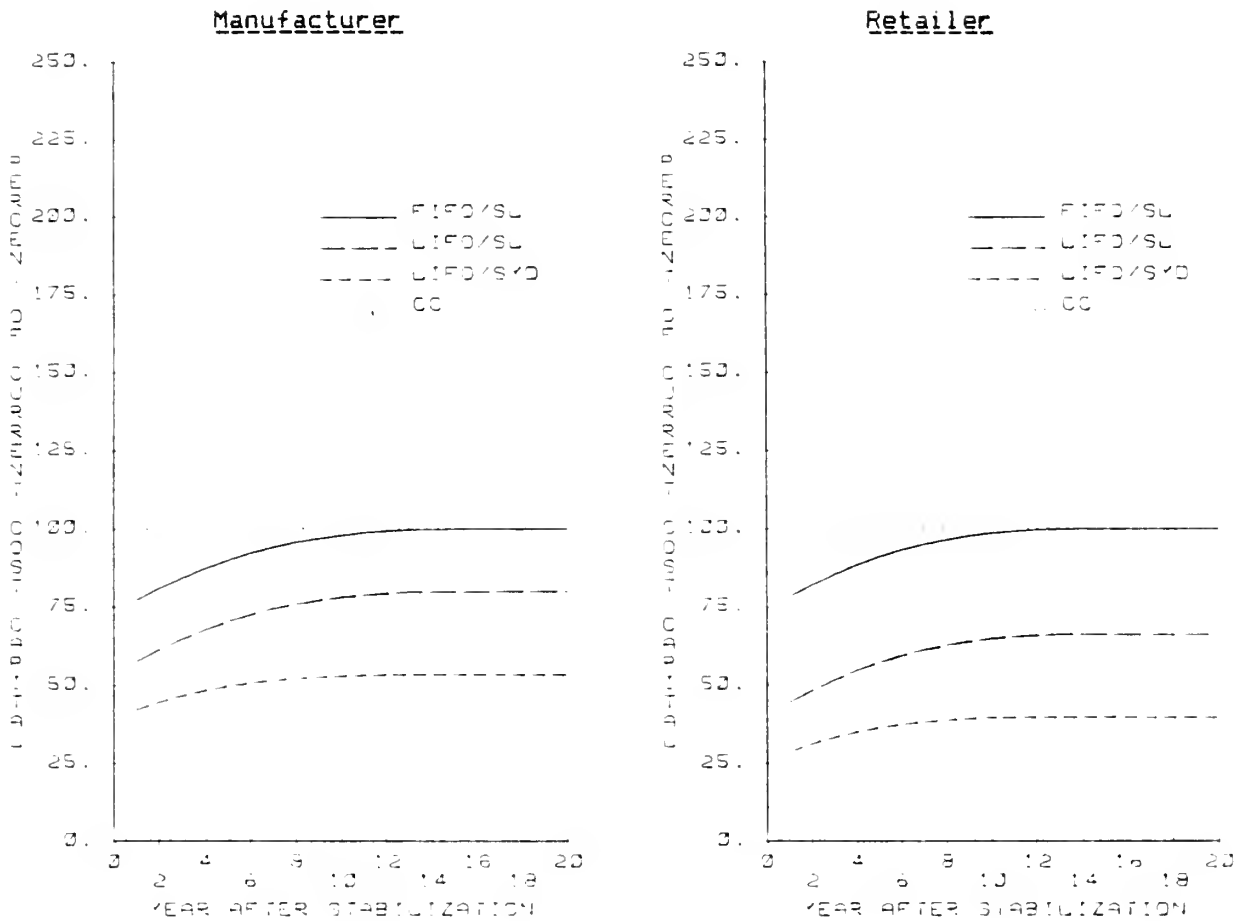


Percent of Current Cost Income

Version	Average Manufacturer			Average Retailer		
	Year 5	Year 10	Year 20	Year 5	Year 10	Year 20
FIFO/SL	174%	128%	100%	145%	116%	100%
LIFO/SL	173%	127%	100%	145%	116%	100%
LIFO/SYD	138%	108%	100%	124%	105%	100%

Exhibit 2

Comparison of Conventional and Current Cost Capital

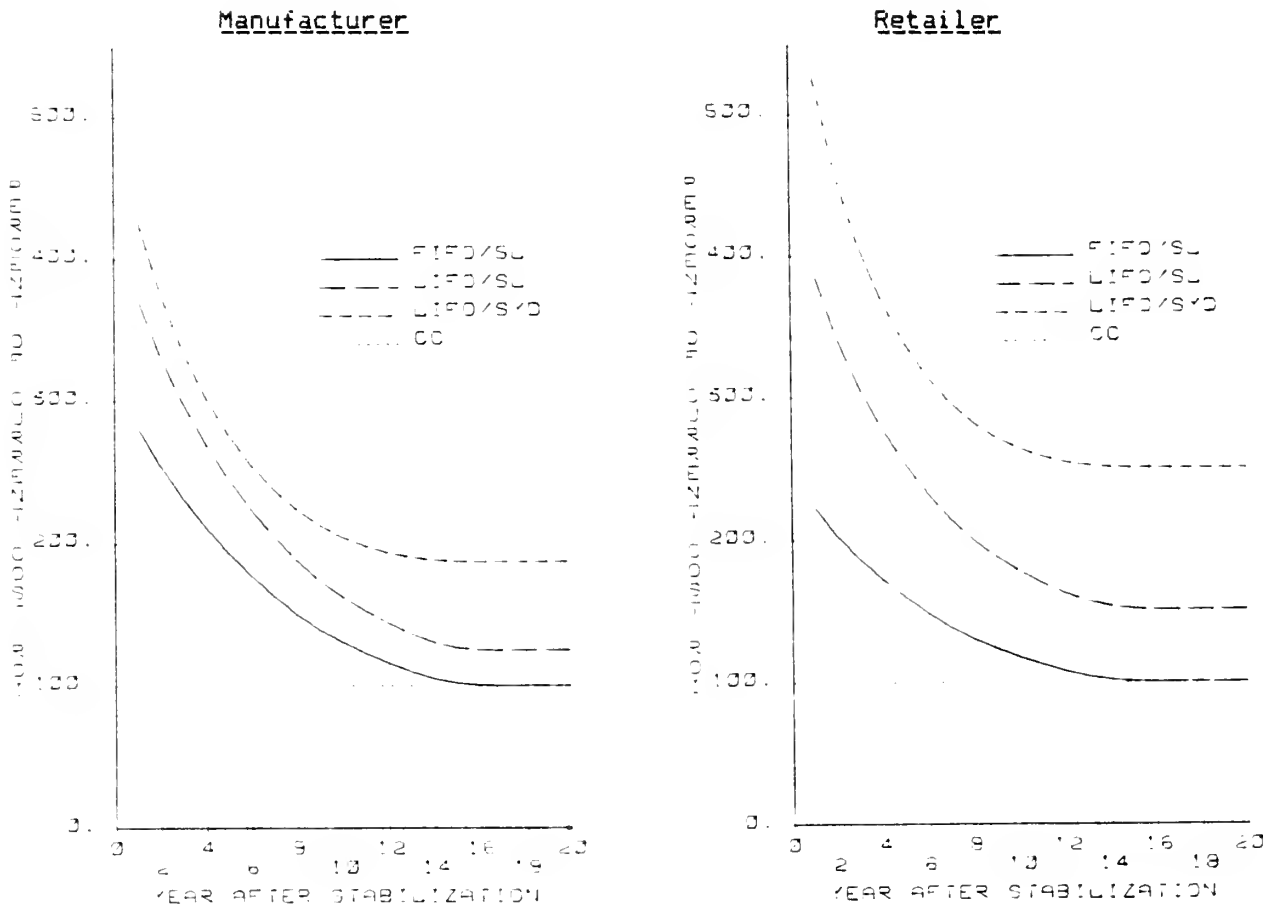


Percent of Current Cost Capital

Version	Average Manufacturer			Average Retailer		
	Year 5	Year 10	Year 20	Year 5	Year 10	Year 20
FIFO/SL	90%	98%	100%	91%	99%	100%
LIFO/SL	70%	78%	80%	57%	65%	66%
LIFO/SYD	50%	53%	54%	37%	40%	40%

Exhibit 3

Comparison of Conventional and Current Cost Rate of Return



Percent of Current Cost Rate of Return

Version	Average Manufacturer			Average Retailer		
	Year 5	Year 10	Year 20	Year 5	Year 10	Year 20
FIFO/SL	193%	130%	100%	159%	117%	100%
LIFO/SL	245%	162%	125%	253%	178%	151%
LIFO/SYD	276%	204%	187%	338%	264%	250%

FOOTNOTES

<sup>1</sup>Edward P. Swanson, "Accounting for Changing Prices: Some Midcourse Corrections," JofA, April 1974, pp. 78-93.

<sup>2</sup>FASB Invitation to Comment: Supplementary Disclosures about the Effects of Changing Prices (Stamford: FASB, December 27, 1983), pp. 7-8.

<sup>3</sup>Additional details of the research design are described in "Comparison of Conventional and Adjusted Performance Measures Under Simulated Price Stabilization," to be presented at the 1984 Annual Meeting of the American Accounting Association.

<sup>4</sup>AICPA, 1983.

<sup>5</sup>Current cost income is not affected by the choice of depreciation method. As long as there is a constant turnover of fixed assets, the sum of accelerated charges would equal the sum of SL charges since all charges would be based on current costs.

<sup>6</sup>Conclusions about SYD are based on the assumption that SL charges would be more appropriate for current costs. Otherwise, SYD capital would converge with current cost and SL capital would eventually be too high.

<sup>7</sup>If accelerated depreciation were appropriate for current costs, only a combination of FIFO and accelerated depreciation would converge with current costs. Accounting Trends and Techniques does not indicate that many firms use such a combination.

<sup>8</sup>op cit., pp. 88-92.









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