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The Fallacy of Asset-Based Adjustments to Profits

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The Section 482 regulations state that if "material differences" exist between controlled and uncontrolled transactions, adjustments must be made if the effect of such differences on prices or profits can be ascertained with sufficient accuracy to improve the reliability of the results. The provision for such adjustments in Regs. §1.482-1(d)(2)—and in Examples 5 and 6 of the comparable profits method provisions at Regs. §1.482-5(e)—has launched a widespread practice of performing adjustments to reflect the "imputed interest" of current assets among selected comparables and the tested party.

In the rush to quantify asset adjustments, the theoretical foundation for those adjustments has been ignored. [1] These asset adjustments have been applied to working capital (in transfer pricing, working capital equals accounts receivable plus inventories minus accounts payable) and separately to balance sheet items classified in accounts receivable, inventories, and accounts payable. The CPM examples, which describe asset adjustments to accounts receivable for outbound transactions and accounts payable for inbound transactions, have been used to justify *deus ex machina* adjustments.

[1] Theoretical and empirical standards of scientific acceptability are discussed by Imre Lakatos in *The Methodology of Scientific Research Programmes*, Cambridge University Press, 1978. "The first thing we ask of any theory is that it should be logically consistent, because an inconsistent theory is compatible with any set of events and any prior beliefs; in short, it is meaningless." Blaug, Mark, *Economic Theories, True of False?*, Edward Elgar Publishers, 1990, p. 7.

These asset adjustments are based on a faulty assumption—that assets and sales are independent (or are not correlated) and hence can be posited as two separate factors in calculating profits. The capital/output ratio, a primary element of the Harrod-Domar model, denies such assumption. [2]

[2] Roy Harrod (1900-1978) and later Evsey Domar (1914-1997) showed that the growth of "capital"—or, for purposes of this article, assets—was determined by two factors: the savings ratio and the capital/output ratio (or γ of Equation 3 below).

Nested Profit Models

Asset adjustments to profits are commonly made using two "nested models." Nested models are specified such that one model is a special case of another. For example, if $\beta = 0$, then model (2) below is equivalent to model (1). [3]

[3] See Kmenta, Jan, *Elements of Econometrics* (Second ed.), Macmillan, 1986, pp. 593-95.

The following two nested models are widely used to make asset adjustments:

(Equation 1) Profits = μ Sales

where Profits denote gross or operating profits and μ denotes profit margin; and

(Equation 2) Profits = α Sales + β Assets,

where Assets denote operating assets and α and β denote coefficients derived from comparable company data.

The arm's-length result is established as a statistical interval. Therefore, Equation 1 and Equation 2 can be re-expressed in its stochastic version by adding a random component.

The flaw in this approach is that sales and assets are not independent of each other. As shown in the appendix, sales and assets are correlated. Further, the problem created by the correlation between sales and assets cannot be avoided by separating assets into individual components such as accounts receivable, inventories, and accounts payable because those components are not independent of assets or sales.

If Equation 2 is deflated by sales, practitioners use the following structural equation to determine the asset-adjusted profit margin:

(2a) Profit Margin = α + β (Asset Intensity),

where Profit Margin = Profits/Sales and Asset Intensity = Assets/Sales.

It follows that α represents the adjusted profit margin and β the imputed interest rate.

The correlation of sales and assets cripples Equation 2 and its deflated variant in Equation 2a. Equations 2 and 2a suggest that sales and assets are independent variables. However, abundant evidence from various industries, as well as the results reported in the appendix, contradict this postulate.

To illustrate, consider a simple linear relationship between assets and sales:

(Equation 3) Assets = γ Sales,

where γ denotes the "capital/output ratio."

Economists recognize that at the macro level, Equation 3 is a cornerstone of the Harrod-Domar model. As an economics matter, it is improper to use the implied nested model specified above disregarding the capital/output relationship.

Substitute Equation 3 into Equation 2 to obtain:

(4) Profits = α Sales + β (γ Sales)
= (α + β γ) Sales
= μ Sales, where μ = (α + β γ).

Equation 4 is equivalent to Equation 1, and therefore has no causal or explanatory power. Equation 1 and Equation 4 have no causal factor because they represent a postulate in which the profit margin is constant (or is a constant within a confidence interval in its stochastic version) among comparables. Substituting Equation 3 into Equation 2a reveals that the deflated variant of the asset adjustment equation is a constant:

(2a) Profit Margin = α + β (Asset Intensity);
= α + β γ = μ.

In principle, μ must be estimated by using Equation 1 because α and β are not independent of each other, and thus cannot be estimated separately by using Equation 2 or Equation 2a. In practice, this problem is obfuscated because β is set by certain practitioners to an arbitrary interest rate, and α is estimated as the difference between profit margin and the given interest rate multiplied by asset intensity.

Reduced-form Equation 4 shows that variants (2) and (2a) cannot be used to make asset adjustments to profits because once the linear relationship between assets and sales in Equation 3 is recognized, the asset adjustment equation vanishes. Consequently, the appropriate profit equation is Equation 1 or Equation 4. Determinants of profits other than assets can be included in the model, provided that such determinants are independent variables. The antitrust literature is replete with alternative formulations of profit equations based on economic factors, such as market share and other proxies of market power. [4]

[4] Among others, see Schmalensee, Richard, "Industrial Economics: An Overview," in Andrew Oswald (ed.), *Surveys in Economics* (on behalf of the Royal Economic Society), Basil Blackwell, Vol. II, 1991.

Equations 1 and 4 are identical, and they include γ as a constant and not as a factor varying from one comparable company to another. Therefore, because sales and assets are correlated, neither Equation 2 nor Equation 2a should be used to make asset adjustments to profits.

Because Equation 1 and Equation 4 have no explanatory power, and because neither Equation 2 nor Equation 2a can be used to perform asset adjustments to profits when Equation 3 nullifies it, it is necessary to contemplate other profit equations that have economic content. For example, Joe Bain initiated a list of factors that include product differentiation, cost advantages, and economies of scale. [5] Among others, these factors can explain profit differentiation among comparables.

[5] *Barriers to New Competition*, Harvard University Press, 1956.

Conclusion

The practice of transfer pricing is rooted in economics, which examines relationships among variables. In light of the high correlation of assets and sales, the widespread practice of making "imputed interest" asset adjustments to profits lacks economic justification. Accordingly, the practice of performing unproven asset adjustments to profits should be abandoned.

Appendix

This appendix discusses the Harrod-Domar relationship between assets (capital) and sales (output), and reports the results of measuring that empirical relationship among U.S. wholesale distributors. As in hermeneutics, "capital" has multiple meanings, and its measurement has created recurring controversies in the economics literature. [1] In principle, assets cannot be measured independent of prices and a given profit rate; therefore, using assets (whose value are a function of the profit rate) in the denominator of the profit rate is a repeated but circuitous nonsense.

[1] Among others, see Hirshleifer, Jack, *Investment, Interest and Capital*, Prentice-Hall, 1970; and Harcourt, G. C., *Some Cambridge Controversies in the Theory of Capital*, Cambridge University Press, 1972.

Harrod and Domar showed that the growth of "capital" (or, for this purpose, assets) was determined by two factors: the savings ratio and the capital/output ratio (or γ of Equation 3 above). [2] The Harrod-Domar equation is a truism, and it becomes a causal model when a testable hypothesis is postulated regarding the behavior of the savings ratio (or γ). In fact, the capital/output ratio is so well-known that Lawrence Klein included γ among the "great ratios" of economics. [3]

[2] Harrod's (1934) innovation was followed by Domar's (1946) contribution. In context, note that John Maynard Keynes's *General Theory* was published in 1936. The relevant entries about the Harrod-Domar model can be reviewed at *The New Palgrave: A Dictionary of Economics* (in four volumes), Macmillan, 1987, which is the most prestigious compendium of economics to date. An interesting discussion of the interdisciplinary milieu around that time is contained in Piero Mini's *Keynes, Bloomsbury and the General Theory*, St. Martins's Press, 1991.

[3] "Some Econometrics of Growth: Great Ratios of Economics," in Lawrence Klein's *Economic Theory and Econometrics*, University of Pennsylvania Press, 1985.

As argued above, certain asset adjustments to profits are improper because they disregard the capital/output ratio. To illustrate this, one may analyze the correlation coefficient between sales and various components of assets for two separate groups of U.S. distributors, classified in Standard Industry Classification codes 50 (durable goods) and 51 (nondurable goods). As the data show (and as postulated in Equation 3), assets and sales are linearly related and the correlation coefficients between those two variables are very high. [4]

[4] The data represent three years of company financials— from fiscal 2000 to 2002, inclusive. Working capital is computed as accounts receivable plus inventories minus accounts payable. The data were obtained at www.edgarstat.com, a Web site containing company financial information and analytics that allows the user to explore the correlation between profit and asset adjustment factors.

Thus, even if Equation 2 was consistent in theory (which it is not because it is inconsistent with the Harrod-

Domar model), the empirical verification that assets and sales are correlated would render asset-based adjustments untenable.

Any suggestion that Equation 3 vitiates asset adjustments in the large (macro-level), but not in the small (micro-level) is likely to be misconceived. Likewise, using profits over operating assets as the profit level indicator does not provide solace from the asset adjustments fallacy suggested above, because return on operating assets has many practical problems of its own. [5]

[5] Some of these are discussed in Edwards, Jeremy; Kay, John, and Mayer, Colin, *The Economic Analysis of Accounting Profitability*, Oxford University Press, 1987.

The matrices and exploratory trellis below show the correlation between operating assets (ao), accounts receivable (rect), inventories (invt), accounts payable (ap), working capital (wc) and net sales among U.S. distributors.

SIC 50 Correlations: sales, ao, rect, invt, ap, wc

	sales	ao	rect	invt	ap
ao	0.971				
rect	0.950	0.968			
invt	0.861	0.842	0.852		
ap	0.979	0.952	0.915	0.920	
wc	0.908	0.960	0.962	0.971	0.863

Cell Contents: Pearson correlation
Source: EdgarStat LLC
Date: October 7, 2003

SIC 51 Correlations: sales, ao, rect, invt, ap, wc

	sales	ao	rect	invt	ap
ao	0.984				
rect	0.950	0.935			
invt	0.948	0.969	0.917		
ap	0.930	0.947	0.864	0.965	
wc	0.909	0.909	0.966	0.916	0.805

Cell Contents: Pearson correlation
Source: EdgarStat LLC
Date: October 7, 2003

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