

## ACCOUNTING FOR RENT

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ABSTRACT. We provide a new derivation of the equivalence between net present value (NPV) and the discounted value of rent, defined as revenue in excess of expenses for inputs including the economic value of the services of owned assets. The expense for asset services is defined to be consistent with asset value. This provides a variant to trademarked management accounting system developed by Stern Stewart & Co., which identifies rent with Economic Value Added (EVA<sup>TM</sup>) and NPV with Market Value Added (MVA<sup>TM</sup>). The Stern-Stewart system defines the expense for asset services based on the cost rather than the value of assets employed. The treatment here has three advantages: it rests on a consistent allocation of the market value of the enterprise between the market value of assets and the NPV/MVA surplus; it removes an arbitrary indeterminacy in the specification of the value of asset services and their economic depreciation; and it identifies changes in NPV/MVA as an integral part of the "surplus" income stream to be measured and managed.

In their classic corporate finance text, Brealey and Myers begin the chapter on present value and the cost of capital as follows:

Companies invest in a variety of real assets. These include tangible assets such as plant and machinery and intangible assets such as management contracts and patents. The object of the investment, or capital budgeting, decision is to find real assets that are worth more than they cost. [5]

The surplus of worth or value over cost for an enterprise or a project is *net present value* (NPV). Corresponding to the concept of NPV as a component of stock of wealth or value, *economic rent* is the component of the income flow that is the excess of output revenue over the required expenses of all inputs.

For agriculture, Ricardo [14] first clarified the basis of income accruing to the property right in the land itself, identifying "rent" as the income earned due to the productivity of "inframarginal" land, after deducting the expense of all other inputs. The key idea is that rent is the residual income accruing to property as the residual claimant. In modern usage the concept of economic rent is now attributed to residual income accruing to any property right.

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For an enterprise that acquires and uses tradeable assets, rents are attributable to the NPV of the “projects” it forms, or, perhaps equivalently, to the “going concern value” of the enterprise itself. If this surplus is not competed away, then its source must be embodied in costly or unreplicable internal economies of planning and operations, transactions and reputational capital in output, input, factor, and funding markets, and in defensible market power in these markets due to legal or customary franchise entitlements .

As agents for owners, the key management target is maximization of surplus value. And the key ongoing management metric – for valuation, stewardship, and incentive-compatible compensation – should be the income attributable to this surplus.

It is intuitive that rent as “residual income” and net present value (NPV) as “residual value” are related. Indeed, it is often demonstrated [7, 16] that NPV is the discounted value of rent variously defined. This idea becomes more subtle when the property is an enterprise that itself owns property in the form of assets that can be traded and valued.

To calculate rent, the services of the owned assets must be imputed and expensed against revenue. This paper develops the implicit expense charge for asset services that is consistent with the valuation of the assets. In the general case this valuation of capital services is consistent with the neoclassical derivation by Arrow [2]. Under simplifying assumptions about depreciation, it is equivalent to Jorgenson’s “user cost of capital services”, which serves as the basis for the modern neoclassical theory of investment [10, 11]. Earlier I have applied this derivation to the valuation of resource projects [12, 13].

In this treatment, enterprise cashflow is partitioned consistently with the partition of its total value between the value of assets and its surplus or net present value. With the residual economic rent consistently defined, we show that the income attributable to the NPV surplus of the enterprise has two components – rent plus the change in NPV. Thus this metric correctly measures the ongoing management tradeoffs between current rent maximization and the future value of the firm.

The management consulting firm Stern Stewart & Co. provides a trademarked information system for enterprise valuation, stewardship, and compensation designed to align owners’ and managers’ interests [17, 6, 18]. This system identifies rent with Economic Value Added (EVA<sup>TM</sup>) and NPV with Market Value Added (MVA<sup>TM</sup>).

The Stern-Stewart system develops the charge for asset services based on a non-market concept of depreciated cost. This has the operational benefit that cost is readily observed from standard accounts. However it suffers from three defects. In the “economic balance sheet”, it is not consistent with the partition of enterprise value between the market value of tradeable assets and the NPV/MVA value of the enterprise itself. In the “economic income statement”, the assessment of asset service expense is not based on an economic valuation of assets or asset depreciation. In stewardship and compensation applications, it does not recognize that income attributable to NPV/MVA comprises both rent and the “capital” gain or loss due to the change in enterprise residual value measured by NPV/MVA.

## ASSET VALUE, INCOME, AND RETURN

To consolidate terminology, we begin with a review of an asset's basic characteristics – value, income, and return.

Abstractly, an asset is characterized by a quadruplet,  $\{V_0, [FCF_t, r_t, V_t]_1^T\}$ , where  $V_0$  is the known or expected value at time 0, and the bracketed term is a triple sequence of expected free cashflows, required returns, and values, defined on  $t \in \mathcal{T} = \{1, \dots, T\}$ . Typically, for an enterprise (a firm or project), cashflow is projected based on its real markets, rate of return is projected based on assessments of risk and capital market costs, and then value is determined by requiring an equilibrium.

**Definition.** *Expected income* is expected cashflow plus value change:<sup>1</sup>

$$Income_t \doteq FCF_t + \Delta V_t, \quad t \in \mathcal{T}. \quad (1)$$

**Definition.** An asset is in *valuation equilibrium* if next years' cashflow plus value reflects the required return:

$$\begin{aligned} V_{t-1}(1 + r_t) &= FCF_t + V_t, \quad t \in \mathcal{T}, \\ V_{t-1} &= \frac{FCF_t + V_t}{1 + r_t}, \quad t \in \mathcal{T}, \end{aligned} \quad (2)$$

$$= \sum_{s=t}^T D_{t,s} FCF_s + D_{t,T} V_T, \quad (3)$$

where  $D_{t,s} = \prod_{s=t}^T (1 + r_s)^{-s}$  and  $D_{t,t} \equiv 1$ .

Then the following is immediate and intuitive.

**Proposition.** *An enterprise is in valuation equilibrium if expected income equals the expected required return:*

$$r_t V_{t-1} = Income_t, \quad t \in \mathcal{T}. \quad (4)$$

Note this implies that the value of an asset is the perpetual annuity value of next period's income,  $V_{t-1} = Income_t / r_t$

## ENTERPRISE WITH SURPLUS

Consider an enterprise  $\mathcal{E}$  that owns tradable assets  $\mathcal{K}$ , and by difference a surplus or NPV asset  $\mathcal{S}$ . Index these assets on the set  $\mathcal{N} = \{e, s, k\}$ . We assume that expected cashflows and returns are observable for the enterprise, and that expected values and returns are

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<sup>1</sup>Hicks classically defines income as follows, “The purpose of income calculations in practical affairs is to give people an indication of the amount which they can consume without impoverishing themselves. Following out this idea, it would seem that we ought to define a mans income as the maximum value which he can consume during a week, and still expect to be as well off at the end of the week as he was at the beginning.” [8, 172]

observable for the tradeable assets. We will derive the imputed asset service expense for tradeable assets, and the rate of return, rent and income accruing to the surplus.

By "tradeable assets" we mean only that the title to those assets can be traded (say by sale and lease-back) and not that the assets must be physically relocated in a sale. Of course, when there is a difference in the value of assets associated with ownership itself, due say to agency costs,<sup>2</sup> then this is incorporated in enterprise surplus value.

For clarity at this point we ignore debt and explicit treatment of taxes. We suppress the subscript time notation and indicate a lagged value with a subscript "-". Let  $\mathcal{N} = \{\mathcal{E}, \mathcal{S}, \mathcal{K}\}$ . Then:

$$V^e = V^s + V^k, \quad t \in \mathcal{T}, \quad (5)$$

$$FCF^e = FCF^s + FCF^k, \quad t \in \mathcal{T}, \quad (6)$$

$$r^i V_-^i = FCF^i + \Delta V^i = Income^i, \quad i \in \mathcal{N}, t \in \mathcal{T}. \quad (7)$$

The conditions of additivity, (5) and (6), and valuation equilibrium, (7), imply the Modigliani-Miller result,

$$r^s = r + (r^e - r^k) s_-^k / (1 - s_-^k), \quad t \in \mathcal{T}. \quad (8)$$

Enterprise free cashflow is net operating profit after tax,  $NOPAT^3$ , minus investment in tradesable assets and the enterprise,  $Inv^k + Inv^s$ . We associate a flow of asset services,  $Serv^K$ , to be determined consistently with  $V^k$ , and define rent as the residual from  $NOPAT$  after expense for asset services.

$$FCF^e = NOPAT - (Inv^k + Inv^s), \quad t \in \mathcal{T}, \quad (9)$$

$$FCF^k = Serv^k - Inv^k, \quad t \in \mathcal{T}, \quad (10)$$

$$Rent = NOPAT - Serv^k \quad t \in \mathcal{T}, \quad (11)$$

$$FCF^s = Rent - Inv^s, \quad t \in \mathcal{T}. \quad (12)$$

Find an expression for  $Serv^k$  by substituting (10) into (7),

$$r^k V_-^k = Serv^k - (Inv^k - \Delta V^k) = Income^k, \quad t \in \mathcal{T}. \quad (13)$$

We define the economic depreciation of tradeable assets,  $EDep^k$ , as the excess of investment over the change in asset value (equivalently, the investment required to maintain asset value unchanged),

$$EDep^k = Inv^k - \Delta V^k, \quad t \in \mathcal{T}. \quad (14)$$

Then the natural characterization of the asset service expense and income results. To justify the valuation of tradeable assets, the enterprise must charge itself required income ( $r^k V_-^k$ )

<sup>2</sup>Monitoring by the principal, bonding by the agent, and residual loss due to incentive-incompatibility [9].

<sup>3</sup>NOPAT is EBITDA minus the taxes that would be paid absent the interest tax shield.

plus economic depreciation.<sup>4</sup>

$$Serv^k = Income^k + EDep^k, \quad t \in \mathcal{T}. \quad (15)$$

We now can evaluate the income attributable to the surplus. From (11) and (7),

$$Income^s = r^s V_-^s = Rent + (\Delta V^s - Inv^s), \quad t \in \mathcal{T}. \quad (16)$$

Note that this relationship will be true for any specification of  $Serv^k$  and  $Rent$ , but only the specification here is consistent with the market valuation of  $V^s = V^e - V^k$ .

### ACCOUNTING FOR RENT

To exploit the double meaning of this paper's title, to what is the "going concern value" of the enterprise attributable? How does a firm realize more income out of its tradeable assets than its competitors? This question is the subject of a vast literature, but we may consider three areas:

- *Internal economies* in planning and operation acquired through investment in enterprise-specific (non-compensated) human capital [4], learning-by-doing [1], or returns to scale exploited through first mover advantage.
- *External advantage* acquired through marketing investment [3], reputationally advantaged output quality [15], and reputational advantaged transactions with suppliers and creditors.
- *Market power* acquired through rent-seeking advantage with regulators or legal preference, that is associated with the enterprise and is not tradeable.

The key tradeoffs between current gain through exploiting enterprise-specific intangible capital, and capital gain through enhancing such capital are correctly measured through our specification of income from surplus, which comprises both.

### ON THE STERN-STEWART EVA<sup>TM</sup> SYSTEM

The advantages of the economic income metric developed here, in my view, are twofold.

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<sup>4</sup>Arrow shows [2] that in general the economic depreciation term is "a weighted average over all [future] time...of the average number of replacements per unit time..., the weights depending on the course of the rate of interest". However, when deterioration is exponential, replacement costs depend on only on the current value of past investment. Suppose the value of vintaged tradeable assets can be decomposed into a price term,  $p_{t,s}^k$ , where the price of second-hand assets reflects obsolescence, and a physical investment term,  $I_s$ , which exhibits exponential (or declining balance) deterioration at rate  $\delta^k$ , so  $V_t^k = \sum_{s=-\infty}^t (1-\delta)^{t-s} p_{t,s}^k I_s$ . Then economic depreciation is a weighted sum of past deterioration and obsolescence,

$$EDep_t^k = Inv_t^k - \Delta V_t^k = \sum_{s=-\infty}^{t-1} (1-\delta)^{t-s-1} (\delta^k - \Delta_1 p_{t-1,s}^k I_s).$$

First, it requires measurement of and is consistent with the market valuation of tradeable assets as an object of stewardship. The most elemental question that owners or potential buyers ought to ask is – should the enterprise own its assets, or should it be liquidated?

The accounting system proposed here requires that tradeable assets be marked to market to value enterprise capital employed. Enterprisemanagement should be credited for capital gains thus accrued, and indeed they are deducted in calculating economic depreciation and required payment for asset services, and thus included in rent. So conversely for losses. It may be argued that in practice this may be difficult to implement and subject to abuse if implemented. I am not prepared to argue these issues, but my own preference is to be conceptually and approximately correct, rather than precisely wrong. At least you know what you are trying to do.

It is not easy to discern from their published literature [17, 6, 18] how Stern-Stewart in fact treat economic depreciation. More explicit is the discussion by Shrives and Wachowitz (S&W)[16], which is cited by Stern-Stewart as an authoritative source [18][5]. S&W remark that “the method of EVA<sup>TM</sup> depreciation will not influence the present value of economic profits,” as noted here at the end of the previous section. They then go on to say, “proponents of EVA<sup>TM</sup> define the notion of market value added (MVA) as the difference between market value of the firm and the EVA<sup>TM</sup> book value of investment in the firm’s assets” (emphasis added). Nowhere, as far as I can tell, is the *market* value of the firm’s assets introduced into the analysis.

The second advantage of the economic income metric proposed here is that it correctly measures the tradeoff between current rent and capital gain. Stern-Stewart’s performance metric is rent alone or EVA, “computed by taking the spread between the return on capital and the cost of capital, multiplied by capital outstanding” [17][742], where “capital” is “net assets” adjusted for leases, reserves, and capitalized goodwill and R&D [17][744]. Nowhere is the change in economic value of the enterprise included in valuation, stewardship, and compensation.

## CONCLUSION

The stewardship and compensation metric identified here – income from surplus value comprising rent and surplus capital gain – correctly values the current gain versus capital gain that is at the heart of capitalistic (intertemporal) management.

## REFERENCES

- [1] Kenneth J. Arrow. The economic implications of learning by doing. *Review of Economic Studies*, 29:155–173, 1962.
- [2] Kenneth J. Arrow. Optimal capital policy, the cost of capital, and myopic decision rules. *Annals of the Institute of Statistical Mathematics*, 16:21–30, 1964.
- [3] Kenneth J. Arrow and Marc Nerlove. Optimal advertising policy under dynamic conditions. *Economica*, n.s. 29:129–42, 1962.

- [4] Gary S. Becker. *Human Capital: A Theoretical and Empirical Analysis*. Cambridge University Press (National Bureau of Economic Research), 2nd edition, 1971.
- [5] Richard A. Brealey and Stewart C. Myers. *Principles of Corporate Finance*. McGraw-Hill Irwin, 2003.
- [6] Al Ehrbar. *EVA: The Real Key to Creating Wealth*. Wiley, 1998.
- [7] Joseph C. Hartman. On the equivalence of net present value and market value added as measures of a project's net worth. *The Engineering Economist*, 45(2):158–164, 2000.
- [8] John R. Hicks. *Value and Capital: An Inquiry into Some Fundamental Principles of Economic Theory*. Clarendon Press, Oxford, 1939.
- [9] Michael C. Jensen and William H. Meckling. Theory of the firm: Managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics*, 3:305–60, 1976.
- [10] Dale W. Jorgenson. Capital theory and investment behavior. *American Economic Review*, 1963.
- [11] Dale W. Jorgenson. Econometric studies of investment behavior: A review. *Journal of Economic Literature*, 1971.
- [12] David Nissen. The economic accounts of the resource firm. In Benjamin Lev, editor, *Energy Models and Studies, Studies in Management Science and System*, volume 9. North-Holland, 1983.
- [13] David Nissen. Economic accounting for project value. In *Proceedings of the 8th Annual North American Conference of the International Association of Energy Economists*, Boston, 1987. MIT Press.
- [14] David Ricardo. *On the Principles of Political Economy, and Taxation*. Penguin reprint, 1971, 1817.
- [15] C. Shapiro. Premiums for high quality products as returns to reputations. *Quarterly Journal of Economics*, 97:659–79, 1983.
- [16] Ronald E. Shrieves and John M. Wachowicz, Jr. Free cash flow (FCF), economic value added (EVA<sup>TM</sup>), and net present value (NPV): A reconciliation of variations of discounted-cash-flow (DCF) valuation. *The Engineering Economist*, 46(1):33–52, 2001.
- [17] G. Bennett Stewart, III. *The Quest for Value*. Harper Business, 1991.
- [18] G. Bennett Stewart, III. Accounting is broken: Here's how to fix it. *EVAuation*, 5(1), 2002.

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