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The double emergence of the Modified Internal Rate of Return: The neglected financial work of Duvillard (1755 – 1832) in a comparative perspective *

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Abstract

This article aims at enhancing current understanding of the history of investment evaluation criteria based on discounting. Their emergence constitutes a challenging issue for scholars devoted to the history of financial economics, as well as to fundamental tools of economic analysis. Their history is analysed in a comparative perspective, starting with the neglected contribution of Duvillard as a reference case. More than two centuries ago, this French language scholar developed, by an optimizing analytical machinery, a financial measure technically similar to Modified Internal Rate of Return (MIRR). In order to assess his theoretical contribution in a comparative perspective, the author will try to briefly account for the different contexts where the

financial measure has been invented twice. This approach, indeed, is concerned with the institutional changes and the theoretical developments they fostered. It analyses concepts such as time preference, techniques such as discounting and issues such as the ‘reinvestment problem’. On the one hand, the Past (especially around the eighteenth century) and Duvillard's contribution is explored. On the other hand, the Present is reconstructed (in particular the late Fifties and later), especially the recent debate that re-invented the MIRR. This article will conclude with some comparative results.

Keywords:

Modified Internal Rate of Return | history of Financial Economics | history of economic analysis | discounting | investment evaluation criteria | capital budgeting

Notes

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1 Where the Present linearly waits for the Past and always advances it. In a comparative perspective, however, one seeks to fully understand the past viewpoint and to compare it with the more recent ones. A stronger comprehensive framework is expected by this deepening of meanings.

2 See also note 24. Generally speaking, see Poitras (2000).

3 It is a variant of the Internal Rate of Return (IRR), with two discount rates of reference, the first being the return on invested capital, the latter the return for the systematic reinvestment of all the incoming cash flows.

4 On usury and the emerging spirits of capitalism, see at least the brief synthesis provided by Le Goff (1986) and De Roover (1968).

5 cf. Appendix I for details.

6 Many fundamental studies focus on the slow emergence and evolution of this new forma mentis (worldview and habits), on its characters and socio-economic dissemination, such as the early quarrel between M. Weber, W. Sombart and G. Simmel.

7 cf. also Baumol and Goldfeld (1968: 153).

8 This second formula is related to the first one by substituting i for y.

9 ‘Le prix d'une annuité (est) égal à la somme de tous les états auxquels chaque année de la rente est réduite par l'escompte jusqu'au temps t auquel elle expire’ (Duvillard 1787: 6, note).

10 So Duvillard defines rent's price: ‘annuity's price equals the sum of each annual amount resulted by discounting it as long as it lasts’, that is the present value of the rent.

11 At the same time, he distinguishes three rates: (1) the natural but fictitious rate of return; (2) the actual and verifiable rate that he developed; and (3) the normal (market?) rate of return. See section 2.3.

12 cf. Appendix II and Biondi (2003) for further details.

13 Elsewhere, the author refers to his recursive method (Duvillard 1787: 23 – 4) as a innovation (see ‘Lettre de M. Duvillard, Archives de l'Académie des Sciences, Institut de France, Paris, pochette de séance du 31 mai 1813’; reproduced in Israël (1993), especially p. 74). Lagrange and Legendre credited Duvillard for applying geometrical methods to mathematics, in their report to Sciences Academy, séance de l'Académie des Sciences, le 11 Vendémiaire an V (le 2 octobre 1796), reproduced both in Thuillier (1997: 235 – 41, especially p. 238) and in Israël (1993: 61 – 6, especially p. 63).

14 See Duvillard (1787), especially p. 83 ss.

15 See Crépel (1990) and the justifications provided by the author himself in ‘lettre de M. Duvillard, Archives de l'Académie des Sciences, Institut de France, Paris, pochette de séance du 10 mai 1813’ (reproduced in Israël (1993), especially pp. 68 – 9).

16 cf. Robertson (1949), Tubaro (2002).

17 On the history of discounting methods, see also Poitras (2000, chapter V).

18 cf. also Theocharis (1983: 85).

19 Duvillard (1787: 66 – 70 and note 18). cf. Biondi (2003: 115 s).

20 see Vasco (1787: 722 ss).

21 see Walras (1900: 250 – 1).

22 See also Samuelson (1937) and Alchian (1955), commented by Robinson (1956), especially about I. Fisher and J.M. Keynes. Interestingly, however, the key notion of liquidity preference, as developed by Keynes, further distinguishes interest rate and intertemporal preferences. Shackle (1967) refers to the Aristotelian idea of money as 'not useful in itself' to justify this point.

23 According to Gintschel (1999), 'Interestingly, Fisher [The theory of Interest, NY 1930] (…) fleshes out his theory by analyzing how the investment opportunity set can be derived from the underlying technology. Unlike most modern financial economists, Fisher interprets his investment opportunity set as more than a collection of cash-flow vectors. Rather, it is a complete characterization of available technology' (ibid.: 327).

24 'Dean's work triggered much academic activity on the discounted cash flow technique. In 1956, a trade journal, The Engineering Economist, was founded to encourage the dissemination of ideas on newly developed capital budgeting techniques, and textbooks soon followed to establish the acceptance of discounted Cash flow techniques among academic scholars and teachers' (Johnson and Kaplan, 1987: 164); see also Miller (1998) and Dean (1954).

25 cf. also Parker (1968: 68 – 9).

26 From the Seventies, Financial Economics became a well-established field based on financial markets efficiency assumptions.

27 Here, just the recent debate that re-invented MIRR is explored. No attempt is made toward a more general survey (see Biondi 2005 for that). Interestingly, some scholars are paying theoretical attention to simple (or hyperbolic) discounting, see at least Laibson (1997) and Loewenstein and Thaler (1989).

28 First labelled Baldwin Rate, Effective Rate of Return (Athanasopoulos 1978) and finally Modified Internal Rate of Return (Lin 1976); see Athanasopoulos (1978).

29 see Hirshleifer (1958: 349b ss), which tributes Solomon (1956) for the generalization. At this time, the controversy about the multiplicity of the internal rates

of return led also to the theoretical development of the truncation theorem, based on the unrestrained possibility of truncating investment projects at any age different from their complete lifetime and at no extra costs (Arrow and Levhary 1969, Flemming and Wright 1971, Eatwell 1975, Sen 1975), a solution proved to be scarcely viable.

30 On the neglected role of accounting theory and profession in the histories of discounting, cf. Parker (1968: 70).

31 In 1959, he edited a collection of important articles on investment evaluation criteria based on discounting, cf. E. Solomon (1959).

32 see Appendix II.

33 About the 'discounting approach', see also C. Price (1993).

34 Athanasopoulos (1978) provides other references.

35 'The salient advantage of ERR method [here, MIRR], compared to all others, is that it combines the recognized reliability of the present worth criteria with the ease of interpretation and understanding inherent in a rate of return (percentage) analysis (…). In view of this clear advantage of the Effective Rate of Return [ERR] technique, serious consideration as the sole criterion for investment profitability is merited' (Athanasopoulos, 1978: 132b). Furthermore, even though a change of replacement rate modifies the MIRR of each investment project, it does not modify its ranking between different projects based on their MIRRs.

36 cf. Biondi (2005) for further developments.

37 Flemming and Wright (1971) also mention the notion of mean as the proper framework for evaluation criteria based on discounting. cf. Biondi (2003: 110 – 1) and Biondi (2005) for further developments.

38 The rate that makes equal the present values of the mutual commitments between lender and borrower. Technically speaking, current definitions of this rate and of IRR are the same. See Duvillard (1787: 62, 70 – 2).

39 when $a_0 \ldots a_n = a$.

40 In this case '(…) management assumes that, for the period between the base point and the time when the funds are spent or collected, the funds are, or could be, invested

at the rate of return being calculated for the proposal'. (Baldwin 1959: 99a). According to Baldwin, MIRR seems indeed based on a more realistic hypothesis.

41 As Duvillard (1787: 18) clearly states, if the annuity rate of return (r or IRR) and the replacement rate (i) have the same value, the value of his IRR (y) will be equal to it. No optimal rate would exist in this case, and the value will be ever-increasing with time.