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Entrepreneurship in a theory of capital and finance—Illustrating the use of subjective quantification

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In order to identify an entrepreneurial opportunity, calculation is required. The entrepreneur must do more than simply perceive an opportunity to do something new to create value in the marketplace. Insofar as alternative possible actions exist, the entrepreneur must choose between them. And even as the chosen opportunity is pursued, he must choose between alternative modes of production and organization in the ongoing combination of resources. The details of the kind of calculation required have been left mostly implicit in the literature. This article borrows from the finance literature to suggest a general and universal framework for such calculation and to offer one possible more specific method for using that framework for ongoing entrepreneurial judgment calls. We describe the familiar context in which entrepreneurial decisions occur and reiterate the importance of understanding the nature of capital in such a context of subjective value, uncertainty, and entrepreneurial imagination. We describe the familiar universal present value arithmetic and how it applies to entrepreneurial calculation. Finally, we take a deeper look at this framework, providing an example of one method of analysis used in financial management.

1 | INTRODUCTION

In order to identify and evaluate an entrepreneurial opportunity, calculation is required. To do something new to create value in the marketplace, the entrepreneur must do more than simply perceive an opportunity. Insofar as alternative possible actions exist, the entrepreneur must choose between them. And even as the chosen opportunity is pursued, he must choose between alternative modes of production and organization in the ongoing combination of resources. It has been pointed out that this requires monetary calculation (Mises, 1949, p. 262). Little beyond this has been said in the entrepreneurial literature. The details of the kind of calculation required have been left mostly implicit. This article borrows from the finance literature to suggest a general and universal framework for such calculation and to offer one possible more specific method for using that framework for ongoing entrepreneurial judgment calls.

Section 2 following describes the familiar context in which entrepreneurial decisions occur and reiterates the importance of understanding the nature of capital in such a context, a context of subjective value, uncertainty, and entrepreneurial imagination. It emphasizes the importance of subjectivism in understanding entrepreneurship. In the two sections following, we turn to quantification. Notwithstanding the subjective nature of entrepreneurial evaluations, quantification is an indispensable component of any entrepreneurial decision. Quantification does not imply the discovery of objective values. Values are always subjective and, when relating to the future, are speculative. Section 3 describes the familiar universal present value arithmetic and how it applies to entrepreneurial calculation and appraisal. Section 4 takes a deeper look at this framework, providing an example of one method of analysis used in financial management. Section 5 concludes.

2 | CAPITAL, SUBJECTIVISM, AND THE ENTREPRENEUR

2.1 | Subjectivism, uncertainty, and imagination

It is the way in which subjectivism is understood that distinguishes the Austrian School of Economics. And this is most important in connection to the role of the entrepreneur. In recent years, the management literature on entrepreneurship has turned to Austrian economics for insights (Alvarez & Barney, 2007; Chiles, Bluedorn, & Gupta, 2007; Chiles, Tuggle, McMullen, Bierman, & Greening, 2010; Foss & Klein, 2012). In the Austrian approach, the subjectivism of value, that distinguishes neoclassical economics from the classical cost of production theory of value, is taken much further, as logically implying the subjectivism of knowledge and expectations as well as of value, a position that is sometimes referred to as "radical subjectivism" (Lachmann, 1976; Schackle, 1979). Although they may share the same information (data), different entrepreneurs will interpret this information differently in determining what they "know" about their environment and in what they expect to happen. Out of subjectivism comes a diversity of expectations, which is the prerequisite for entrepreneurial opportunities.

It is the absence of entrepreneurial opportunities that distinguishes static neoclassical economics from dynamic Austrian economics. Neoclassical economics focuses on attained equilibrium states in which subjective perceptions (knowledge and expectations) align. Equilibrium implies the mutual compatibility of individual plans (to produce and consume; Hayek, 1937; Lewin, 1997) so that all divergence of expectations disappears. An attained equilibrium is a situational optimum in which there is no opportunity for entrepreneurial creation or discovery of value-adding opportunities. There are no entrepreneurial profits and losses because they have all been competed away. And, by implication, there is no uncertainty, no innovation. In consequence, neoclassical economics has nothing to say about the nature of entrepreneurship (Baumol, 1968).

By contrast, Austrian economics focuses on action in disequilibrium. Expectations remain divergent, and learning is ongoing. Competition is a discovery procedure (Hayek, 1968) as entrepreneurs seek to combine resources in new profitable ways. Consequently, ideas about the nature of entrepreneurship fit naturally into Austrian economics. Such ideas have been the basis for the so-called "opportunity debate" within management studies about the epistemological and ontological status of entrepreneurship—whether opportunities should be viewed as "preexisting," waiting to be discovered (Kirzner, 1973, 1979; Kizner, 2000), or whether they are better viewed as "created" by the "active minds" of entrepreneurs, that is, whether the future is somehow "out there" waiting to be developed, or whether it is the yet to be created emergent outcome of the actions and interactions of multiple entrepreneurs (Chiles et al., 2007; Lachmann, 1976; Schackle, 1979). In Lachmann's view, like Schumpeter's (Schumpeter, 1911), the entrepreneur possesses an active imagination in which unprecedented unique futures are envisaged.

It is not necessary here to further describe this debate or to attempt a resolution. The essential element of the dynamic world is the divergence of expectations that comes from subjectivism and the ongoing scope for entrepreneurial profit and loss, however such opportunities are envisaged. What matters is that entrepreneurial perceptions are uncertain in the Knightian sense (as distinct from purely risky), that is, the entrepreneur faces a future in which not all the possible outcomes can be known and anticipated (Knight, 1921)[1]. That is the nature of the real world in which entrepreneurship exists.

2.2 | Capital, calculation, and the entrepreneur

At the heart of the dynamic view of the market process is the passage of time. All action occurs in the present, with imperfect memories of the past and uncertain expectations of the future. In particular, production occurs over time in anticipation of profit arising out of the creation of value. The Austrian economists have been much preoccupied with the role of time in production giving rise to a distinctive approach known as the Austrian Theory of Capital (Lewin & Cachanosky, 2018a, 2019). Eugen von Böhm-Bawerk, building on the work of Carl Menger (Böhm-Bawerk, 1959; Menger, 1871), created a theory of capital in which the role of time was central. According to him, the more "roundabout" a production project, the more productive of value it would have to be to justify the extra time taken. But how should one express the idea of "extra time taken"? In the attempt to answer this question, Böhm-Bawerk invented a theoretical construct known as the average period of production (APP), which purports to measure the amount of time on average that any production process takes from beginning to end (the emergence of the final product). The APP became the center of a long, intricate controversy over the nature of capital and production, both within Austrian economics and more broadly, in which the measurement of capital (as time or any other metric) was an important component[2].

In the APP, Böhm-Bawerk had tried to find a measure of capital in terms of time, which, in fact, collapses into a measure in terms of "labor time," a purely physical measure, one which would serve in later developments to calibrate the "amount" of capital (a physical "factor of production") employed in any project or business. As such, it assumes that it is possible to aggregate all of the various type of production goods into a total measure of "capital."[3]

It was Ludwig Lachmann who put paid to the idea of aggregating production goods into a meaningful physical total (Lachmann, 1956). The only way in which one could conceivably aggregate the heterogeneous production goods that make up the complex structure of any economy was in terms of their value[4]. In a world of radical subjectivism, the real world, however, the value of any production good, and thus any combination of production goods (and labor services as well), was a matter of the subjective, idiosyncratic appraisal[5] of the organizing entrepreneur (based on his anticipation of the revenue it will generate). There was simply no way to add up these subjective appraisals, whose value and profitability after all depended on the uniqueness and correctness of the particular entrepreneur's expectations. Thus, one should abandon the quest to obtain such an aggregate and concentrate instead on the nature of the layered structure of production, in which the heterogeneous capital goods and labor services, combined to produce the valuable outputs we see (Endres & Harper, 2013).

Perhaps insufficiently noted, there is another level to Lachmann's entrepreneur. In addition to any originating role that she might have, Lachmann's entrepreneur is a managing entrepreneur. Her role is to combine, within the firm and across firms, complementary productive resources to produce outputs for sale. This organizing task takes place in disequilibrium, it is a trial and error process. Unexpected changes may cause the entrepreneur to make substitutions and sometimes to abandon existing capital combinations. In creating and regrouping such capital combinations, the entrepreneur exercises his best judgment, forming and reforming the best plan of action in a changing world (Foss & Klein, 2012; Knight, 1921). Although this view of the entrepreneur as exercising subjective judgment has spurned some discussion, little by way of detail about the type of thought processes that may be involved has be given. In a world of subjective, incommensurate values, how exactly does the entrepreneur arrive at an appraisal of the worth of his production plan in order to compare it with imagined alternatives? It is in answer to this that we must turn to Ludwig von Mises's emphasis on the importance of calculation in a dynamic market economy.

Recent work (Braun, Lewin, & Cachanosky, 2016; Lewin & Cachanosky, 2018a, 2019) has drawn attention to Mises's distinctive view of capital as a value construct[6]. For Mises capital, as distinct from capital goods (production goods), is a money value.

> Capital is the sum of the money equivalent of all assets minus the sum of the money equivalent of all liabilities as dedicated at a definite date to the conduct of the operations of a definite business unit. It does not matter in what these assets may consist, whether they are pieces of land, buildings, equipment, tools, goods of any kind and order, claims, receivables, cash, or whatever (Mises, 1949, p. 262).

And

> From the notion of *capital-goods* one must clearly distinguish the concept of *capital*. The concept of capital is the fundamental concept of economic calculation, the foremost mental tool of the conduct of affairs in the market economy. (Mises, 1949, p. 263, italics added)[7].

This way of looking at capital is obviously rooted in basic accounting concepts and by implication, also in finance (of which more below)[8]. He sees the entrepreneur attaching monetary values to various possible combinations of productive resources (physical and human) in his employ (owned or rented) and using these "appraisals" to guide his actions. In forming these appraisals, the entrepreneur will be guided, where possible, by the observed market prices for goods and services. Indeed, without a market for the valuation of means of production (and output), the entrepreneur would be completely at a loss as to the value of her business assets. Market prices provide the backdrop necessary for the calculating function of the entrepreneur (Lewin, 1998). The social institutions of money, accounting, and financial markets are indispensable for the functioning of a market economy. Capital is thus an institutionally specific social construct (Hodgson, 2014). It is the essence of capitalism as Karl Marx clearly understood, without understanding how indispensable it is. As Mises would put it, in a centrally planned collective ownership (socialist) economy, there may be capital goods but there cannot be capital[9].

In this way of thinking, the entrepreneur in a market economy is a capitalist whose task it is to estimate the capital-value of innovative resource combinations and production processes and act on them. The entrepreneur is a capitalist calculator. The calculation function is indispensable for the functioning of the trial and error competitive process that is the market economy.

Lachmann's managing entrepreneur, by combining complementary resources of varying specificity, continually specifies and respecifies combinations of production goods. Mises view, only recently highlighted, complements the Hayek–Lachmann view of the capital structure composed of heterogeneous production goods by adding information on how the entrepreneur thinks about these incommensurable items in combination and compares them. It is not suggested that in creating monetary appraisals, the entrepreneur is arriving at an objective value for them. These are not equilibrium values. They are subjective appraisals in an ever-changing uncertain world. We may think of them as the result of subjective quantification. In their absence, there would be no economically rational basis upon which the entrepreneur could make a decision. It does not mean that such decisions are the correct ones. In a world in which different entrepreneurs have different competing expectations, at most one of them can be proved right. But in the absence of the ability to make a decision, there is no action and no trial and error process. The complex production structure that is the engine for the prosperity of the modern market economy is the result of this trial and error process, in other words, the result of ongoing entrepreneurship.

3 | THE FINANCIAL FRAMEWORK FOR CALCULATION

Having underscored the subjective nature of the ongoing entrepreneurial decision-making process, we turn now to an examination of the type of quantification essential to entrepreneurial decision making.

3.1 | The universal arithmetic of present value and the concept of duration

Although Mises (and others) focuses on capital as a value phenomenon, none of these economists (with the partial exception of Irving Fisher) nor the Austrian economists in general, provides an account of how, in abstract terms, such calculations are made. The business discipline of finance is built around this. The core concept is discounting to arrive at a present value of future anticipated returns (earnings). Whether explicit or not, this is the necessary process by which time-consuming production projects have to be compared. There is in a sense a universal arithmetic of present value.

Contemplating alternative expected income streams (net of expenses and imputed costs) the entrepreneur must find a way to adjust not only for the heterogeneity of the resources employed, as already discussed, but also for, as it were, their "time heterogeneity," the fact that the time pattern of the net incomes may differ. Some may promise returns on average earlier than others. So it is not merely the magnitude of the returns expected over the lifetime of the project that matters but also, crucially, the "amount of time" that it takes to earn that magnitude. We are back to Böhm-Bawerk's problem albeit in a different guise. But unlike Böhm-Bawerk's formulation, this version has a sensible and helpful solution. Böhm-Bawerk sought a measure of time in terms of physical quantities, an illusory quest. If we abandon the idea of capital as a physical entity and instead think of it as an accounting construct, we can calibrate the amount of time involved in any time-consuming project in value terms, as the amount of time on average for which one has to wait to earn a dollar from the project. This construct is known in the finance literature (and in financial practice) as duration (*D*). *D* is a simple extension of the ides of present value[10].

We can illustrate the essentials as follows. The present value of any firm (or project), which we shall call its capital value, estimated at time 0, CV_0, can be written:

$$CV_0 = \sum_{t=0}^{\infty} f^t FCF_t \tag{1}$$

where, FCF_t is the "free cash flow" or the net earnings of the business in period *t*, and *f* is the discount factor, the multiplier used to discount the value of the earnings for their remoteness in time from the present. $f = 1/(1+d)$, where *d* is the discount rate used (often assumed to be equal to the "opportunity cost of capital"). With this familiar reasoning, the decision-making entrepreneur can arrive at a number that takes account of the value of the earnings anticipated and the time involved in producing and earning them. The process can be complicated in various ways to take account of varying discount rates for different periods to accommodate changing degrees of risk aversion and in other ways, but the essence remains the same. The equation provides the universal elements necessary for subjective quantification, namely, a projection of future values and a way of discounting them to account for time preference and risk and uncertainty aversion[11].

We can use Equation (1) to construct a measure of the time involved in production. This is *D*.

$$D_0 = \sum_{t=0}^{n} t \cdot \left[\frac{f^t FCF_t}{CV_0}\right] \quad \text{or} \quad D_0 = \sum_{t=0}^{n} t\left[w_t\right] \tag{2}$$

where, w_t are the weights applied to the time period *t* in which the earnings occur. These weights are simply the proportion of the present (capital) value (CV_0) earned in that period. So *D* is a weighted average of the time involved, or, in other words, the average amount of time one has to wait to earn a dollar. *CV* and *D* provide the necessary ingredients of a financial decision-making (subjective quantification) framework.

A vast literature exists on variations to this theme. Below we provide an example of how entrepreneurs may use the abstract reasoning of managerial finance to guide their decisions in more detail. This is the economic value-added (EVA®) framework.

4 | THE EVA® FRAMEWORK

4.1 | From FCF to EVA®—Separating profit and loss results from investment decisions

The FCF methodology is widely used, and its benefits are well known. Yet it suffers from a particular shortcoming in terms of analyzing the financial soundness of a firm. The issue is that the FCF does not distinguish between business operation decisions and investment decisions. In other words, a payment for raw materials needed for the production of a good is mixed with a payment to build a new manufacturing plant. A firm may be enjoying economic profits and yet pay for an even larger investment that would result in a negative FCF for that particular period. Both a rapidly expanding firm that is enjoying profits and a firm making losses would depict a negative FCF. The EVA methodology is a mathematical transformation of the FCF method that divides cash flows into business operations and investment decisions. The EVA framework presents its results in accordance with basic economic intuition.

Let us first introduce some terminology. We note the distinction between two kinds of expenditures (accounting costs), those resources used for the production of current output (sold for current revenue), and those resources used to add to the production of future output (to be sold for future revenue).

- FCF_t, as explained above, is the free cash flow in period *t*. It is equivalent to the accounting profit of the firm.
- $NI_t = W_t - W_{t-1}$ is the net investment in period *t*, where $W_t = \sum_1^t NI_t$
- $NOPAT_t$ represents the net operating profits after taxes, which corresponds to the net output value of the firm, such that for any period *t*, it is equal to $FCF_t - NI_t = FCF_t - (W_t - W_{t-1})$.
- $ROIC_t$ is the current "return on invested capital" $\left(\frac{NOPAT_t}{\sum_1^t NI_t}\right) = \left(\frac{NOPAT_t}{W_t}\right)$
- *c* is the weighted average cost of capital over the relevant period n.
- EVA_t is the economic value added of any given period equals the spread between the ROIC and *c* times accumulated investments (W_t).

- MVA_t is the market value added up to the end of period $t = \sum_{t=1}^{n} f^t EVA_t$ where, it will be remembered $f^t = \frac{1}{(1+c)^t}$ is the discount factor, using c in place of d as the discount rate.[12]

It should be clear that the EVA methodology we develop below is a management tool and as such requires a set of judgment calls by the entrepreneur. A marketing campaign, for instance, can be considered to be a current operating expense geared to the immediate future or a market share investment necessary for long term future earnings. Much depends on whether this expenditure is expected to be repeated. How this expenditure should be considered is in itself an entrepreneurial decision. It requires a vision and understanding of the industry and the firm to make the right judgment call. Note that this entrepreneurial decision regarding the economic interpretation of an expenditures may or may not coincide with accounting and tax legal report requirements.[13] The fact that an EVA evaluation of a firm yields one result (or a range of values under a scenario analysis) does not mean that this (or any other) valuation method produces the "objective" true measure of the value of the firm.

We should emphasize that the assumptions about how to value a firm are also in themselves entrepreneurial decisions. An entrepreneur qua entrepreneur is usually described as a person with the aptitude and capacity to find or create profit opportunities, as it were, out there in the marketplace. Yet the decision to count an expenditure such as a marketing campaign as a necessary operating cost or as an investment in brand building, requires an entrepreneurial interpretation and decision within the firm. When it comes to entrepreneurship, there is the external (out there) and internal (within) types. In this sense, an entrepreneur needs not only to apply his skills to the market, to spot profit opportunities, he also needs to be an entrepreneur inside his own firm. The general point we seek to emphasize is that the real world entrepreneur is a "double layer" entrepreneur. Her role is my no means confined to the origination of profitable opportunities. It is necessarily ongoing, the continual exercise of judgment at each twist and turn in the life of the business (production project). One crucial aspect of this is the use of a financial-accounting framework within which to weigh the alternatives involved, which we now investigate in some detail by way of illustration.

We know that FCF = NOPAT+NI and EVA = (ROIC − c) · W in any period (suppressing subscripts for simplicity). These are Equations (3) and (4) below which, it should be remembered, are mathematically equivalent. It is easy to see that FCF can be negative if NOPAT > 0, NI < 0, and NOPAT − NI < 0.

$$CV_o = \sum_{t=0}^{n} f^t FCF_t \tag{3}$$

$$CV_0 = W_0 + \sum_{t=1}^{n} f^t (ROIC_t - c) W_{t-1} = W_0 + \sum_{t=1}^{n} f^t EVA_t = W_0 + MVA \tag{4}$$

Note the following characteristics of the EVA representation (Equation (4)). First, EVA is the familiar concept of economic profit expressed in rates rather than in nominal values. It is a reflection of the net value expected to be added by the investment ($MVA = CV_0 - W_0$), regardless of the size of operating profit or loss. Net investment is captured as different values of W in each period. The value of the firm is represented as the initial value of W plus the present value of future expected EVAs, which equals the market value (to be) added (MVA) (i.e., the market value[14] added to W_0).

Consider two investors who are considering investing in the same project. Both of them would assign the same (market) value to W_0. This would be the market price of the productive assets under their control. The difference in their respective values of CV_0 is explained by different values in their respective MVAs. The differences in their respective MVAs are due to their different expectations of how well they think they can manage the productive assets of the firm. Put it differently, although W_0 is the value they expect to receive by selling the firm in the market, CV_0 represents the value the firm would have under the entrepreneurs control. Note that this is closer to Mises's conception of capital as a financial construct than it is to the capital as physical goods conception.

The EVA framework is mostly applied in the world of corporate finance to analyze if a firm is creating value and how different areas are performing (see the next section), to define market strategies, and even to develop compensation rules for managers. Recall that this application also requires judgment and assumptions on the part of the entrepreneurial managers (i.e., how to split operating costs and investments). For instance, managers paid to produce more profits as measured by EVA rather than FCF or accounting profits can be a way to deal with the principal-agent problem. For outsiders, such as financial analysists, making an "EVA evaluation" of a firm can offer a clearer assessment of the firm's situation and allow one to decide if stock prices are accurately capturing the fundamentals of the firm depending upon one's assessment of the MVA.

Let us now use an example to show the differences between FCF and EVA methodologies (Table 1). Assume a firm has a forecast of four periods of growth. In Period 5, the firm reaches a steady growth rate that can be represented as a perpetuity where the firm growth rate equals the opportunity cost of capital (from Period 5 onwards, the firm's investment ratio equals the cost of capital such that the calculated capital value remains constant).[15] The company decides to invest in order to increase its future revenue and maximize its expected market value. In Period 1, the net investment is less than the NOPAT, and therefore, the firm is exhibiting a positive FCF. However, in Periods 2 and 3, the firm expects to increase its net investment; the FCF is negative even if the NOPAT is positive. Yet there is a difference between these two periods. In Period 2, we observe a positive EVA. However, in Period 3, we observe a negative EVA, not because the firm has a negative NOPAT, but because the return on capital (ROIC) is less than the opportunity cost (c). In Period 4, the firm has positive accounting profits (Profit > 0) but negative economic profits (EVA < 0). Finally, let us assume that c = 0.10 and that W_0 = $1,000.

Table 1 illustrates the above-discussed features of the EVA methodology. The table does not just capture profits estimations based on

TABLE 1 Comparison of FCF and EVA methodologies

Period	0	1	2	3	4	5+
Revenue	$1,000.0	$1,100.0	$1,200.0	$1,500.0	$1,600.0	$1,700.0
(Operating) Cost	$600.0	$650.0	$700.0	$800.0	$900.0	$1,100.0
Profit	$400.0	$450.0	$500.0	$700.0	$700.0	$600.0
Net Investment (*NI*)	-	$100.0	$300.0	$600.0	$100.0	0*
NOPAT	$400.0	$350.0	$200.0	$100.0	$600.0	$600.0
Invested Funds (*W*)	$1,000.0	$1,000.0	$1,100.0	$1,400.0	$2,000.0	$2,100.0
ROIC (NOPAT/*W*)	0.40	0.35	0.18	0.07	0.30	0.19
Opportunity cost of capital (c)	0.10	0.10	0.10	0.10	0.10	0.10
FCF (NOPAT − NI)		$250.0	−$100.0	−$500.0	$500.0	$6,000.0*
FCF (present value)		$227.3	−$82.6	−$375.7	$341.5	$4,098.1
Firm value (FCF methodology)	$4,208.6					
EVA ((ROIC − *c*)*W*)		$250.0	$90.0	−$40.0	$400	$3,900.0*
EVA (present value)		$227.0	$74.4	−$30.1	$273.2	$2,663.8
EVA (sum of present values)	$3,208.6					
Initial investment (W_0)	$1,000.0					
Firm value (EVA methodology)	$4,208.6					

*Perpetuity value.

what the entrepreneur thinks is going to happen. It also captures his internal entrepreneurial vision on which expenditures constitutes a cost and which ones constitute an investment. Surely, some cases are easy to differentiate, such as buying raw materials or building a new manufacturing plant. Yet some sizable expenditures may not obviously be one or the other (again, regardless of accounting and tax requirements). EVA does not claim to have a different or better valuation result, rather it offers a potentially more transparent way to represent what is happening to the firm. For business managers, EVA offers better information in order to make better decisions based on the judgment of how to interpret different costs. Look, in particular, at Period 2. A simple look at the FCF may suggest that the firm has incurred losses in that period. However, the EVA representation suggests that the firm actually made $74.40 in profits in present-value terms (according to the judgment of the entrepreneur/accountant). Although both methodologies get to the same valuation of the overall performance of the firm, the EVA representation offers a more transparent reflection of each period the firm is being evaluated. As mentioned above, we can see that the EVA framework also shows the evolution of the financial capital of the firm. Changes in the size of the firm (net investment) is not lost information; it is represented in a different perspective.[16]

In terms of textbook microeconomic market equilibrium, in the long run, freedom of entry and exit in the market ceases when EVA = 0 for all firms. At this point, the owners of the firm receive an ROIC that just compensates for their opportunity cost. EVA, like standard economic profits, is a measure of extraordinary profits or profits beyond the opportunity cost of capital. This would be the financial equivalent of long-run equilibrium under perfect competition.

4.2 | A deeper look: Value drivers

The EVA framework offers an overall assessment of the firm. Yet an EVA calculation can also be disaggregated into its value drivers. We can think of the value drivers as the microcomponents of the firm. This is done by disaggregating the NOPAT into different components. Let us multiply and divide the ROIC by total revenue (TR). NOPAT equals total revenue minus the different costs that the firm incurs (such as depreciation, inventory maintenance, and marketing, captured as $C_1,\ldots,C_n$). For simplicity, we assume there are no taxes, and therefore, there is no need to make a tax-shield adjustment. Then, we can expand Equation (5) as follows (also, time subscripts are suppressed for simplicity).

$$\mathrm{ROIC} = \frac{\mathrm{NOPAT}}{W} \tag{5}$$

$$\mathrm{ROIC} = \frac{\frac{\mathrm{NOPAT}}{\mathrm{TR}}\cdot \mathrm{TR}}{W}$$

$$\mathrm{ROIC} = \frac{\frac{\mathrm{TR}-C_1-C_2-\ldots-C_n}{\mathrm{TR}}\cdot \mathrm{TR}}{W}$$

$$\mathrm{ROIC} = \underbrace{\left[1-\frac{C_1}{\mathrm{TR}}-\frac{C_2}{\mathrm{TR}}-\ldots-\frac{C_n}{\mathrm{TR}}\right]}_{\text{value drivers}}\cdot\frac{\mathrm{TR}}{W}$$

Equation (5) represents the current return on capital (invested funds) as 1 minus the different costs of the firm (from 1 to *n*) as shares of the total revenue. These are the value drivers. The value drivers are indexed by the accumulated investment funds up to each period of the existence of the firm to get the typical return over invested capital

(ROIC) measure. This expression opens the ROIC into its "microcomponents." For instance, a firm can observe that C_1 is a heavy drain on its ROIC and try to find a way to reduce the C_1/TR ratio, an estimate to increase in ROIC, and with it increase EVA. Alternatively, a firm may observe that C_2 has a small impact on the ROIC, and therefore, not much energy should be allocated in trying to economize this type of cost in the firm.

The more disaggregated the value drivers are, the more detailed the information the firm can obtain on what is driving its returns. It is also possible to disaggregate total revenue into components (denoted by the Greek letter Ω). Ponder now Equation (5) (where $\omega_j = \Omega_j/TR$ and $\theta_i = C_i/TR$), which give a more detailed representation of Equation (5).

$$ROIC = \left[\left(\frac{\Omega_1}{TR} + \frac{\Omega_2}{TR} + \ldots + \frac{\Omega_m}{TR}\right) - \left(\frac{C_1}{TR} + \frac{C_2}{TR} + \ldots + \frac{C_n}{TR}\right)\right] \cdot \frac{TR}{W} \quad (6)$$

$$\mathrm{ROIC} = \left[(\omega_1 + \omega_2 + \ldots + \omega_m) - (\theta_1 + \theta_2 + \ldots + \theta_n)\right] \cdot \frac{\mathrm{TR}}{\mathrm{W}}$$

In this representation, each Ω can represent a different geographic area in which the firm operates, or a different business unit, or maybe a different product family, and so forth. Consider a large car manufacturer. The value drivers can be represented by country (United States, Canada, etc.), or by type of client (private consumer, corporate, etc.), or also by type of good (sedans, trucks, sport cars, etc.). Similarly, there can be different ways to slice the operating costs of the firm. It is also possible to disaggregate *W* into different components, and evaluate the return on the investment structure of the firm, or by type of investor, or geographic location of the investor, and so forth. A value driver analysis can be adapted to the various different interests of the firm managers.

If a slice of revenue (ω) is matched with its slice of costs (θ), then we can see the economic profit or loss per "slice" of the firm. This matching shows if the return of any of these slices is more or less than its associated opportunity cost. Certainly, a perfect matching may not be possible, as some costs are shared by different areas of the firm (e.g., depreciation on shared plant), and cash flows are potentially overlapping. Yet this principle can often guide the manager's evaluation of the firm to provide a more discerning map of sources of profit. Value drivers allow for close inspection of the source of economic profit (i.e., EVAs) of the firm. To emphasize once more, all this requires a managerial, or internal, entrepreneurial assessment, of how to read and understand what is happening inside the firm.

5 | CONCLUSION

We began by underlining the important aspects of entrepreneurial decision making, emphasizing the subjectivist aspects, and combining the subjectivism of Lachmann's managing, specifying entrepreneur with Mises's calculating, appraising entrepreneur. We then turned to an examination of the quantitative ingredients necessary for any appraisal. We illustrated this further with an examination of a specific application and extension of the essential general components, namely, the EVA approach.

Subjectivism does not imply the inability to calculate in quantitative terms. Quite the contrary, quantification remains necessary for decision making under uncertainty, even though the estimated quantities (monetary values) are based on speculative expectations. This is perhaps the most important function of the competitive market, namely, to enable entrepreneurs to make decisions about the use of resources and to subject those decisions to the market test. Stable monetary institutions and accounting and finance concepts and conventions are indispensable aids in the making of these decisions. By implication then, economic policies that foster stable money and facilitate the adoption and development of helpful accounting and financial conventions are conducive to productive entrepreneurial decision making.

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ENDNOTES

[1] Uncertainty is distinguished from risk in that a risky situation is one in which all future outcomes can be envisaged and probabilities of occurrence can be attached to them, whereas an uncertain situation is one in which the list of possible outcomes is open (incompletable).

[2] The idea of capital having this time dimension was central also to the later development by Ludwig von Mises and F. A. Hayek (1931) of a distinct Austrian approach to the macroeconomics of business cycles, known as Austrian Business Cycle Theory. A credit induced reduction in interest rates might "lengthen" the production structure in an unsustainable way producing a business cycle.

[3] This is the origin of the subsequent notion of *K* in the neoclassical production function, $Q = f(K,L)$, where *Q* is physical output, *L* is labor, and *K* is capital (*K* and *L* are the factors of production). For a critique of the neoclassical production function in this context, see Lewin & Cachanosky, 2019, section 8.

[4] To attempt to do so, as Böhm-Bawerk had done, in terms of labor time was to resort to an invalid cost of production approach in which labor services were homogeneous and possessed objective value indicative of the value of the production good in question.

[5] This useful term is due to Mises (see the discussion in the text below). It nicely captures the mental process that precedes the entrepreneurial decision.

[6] Which seems to have been foreshadowed by Menger, 1888.

[7] Mises would prefer not to use the term "capital" in any way to denote physical production goods. But given the common usage, he considers that at least we ought to distinguish carefully between "capital" and "capital goods." We "may *acquiesce* in the terminological usage of calling the produced factors of production capital-goods. *But this does not render the concept of real [physical] capital any more meaningful.* (Mises, 1949, p. 263, italics added).

[8] In this conception, Mises was preceded by some other economists, notably Irving Fisher (1906) and Frank Fetter (1927) and many earlier German language economists (see Braun, 2017).

[9] Indeed, this is the basis upon which Mises's famous and compelling critique of Socialism (1922) as well as the later Socialist Calculation debate in which Hayek featured so prominently (Hayek, 1935).

[10] The concept of duration was discovered by the financial actuary Frederic Macaulay (1938) and independently by John Hicks

(1939) who called it the "average period." Hicks was seeking a viable alternative to Böhm-Bawerk's APP and found it, but inexplicably, this went unrecognized until very recently (Lewin & Cachanosky, 2018b).

[11] Intuitively, the longer one has to wait for earnings the more risk and uncertainty will be involved.

[12] In the EVA and financial literature, it is typical to use *K* instead of *W*. We prefer to use *K* to mean the expected (estimated) present value of the services provided by productive assets. *K* carries a lot of baggage from economics and finance. For a more detailed discussion of EVA®, especially with its applications to corporate finance, see Cachanosky, J. C. (1999), Ehrbar (1998), Koller, Goedhart, and Wessels (1990), Stern, Shiely, and Ross (2003), and Young and O'Byrne (2000). For a proof of the equality of the two equations for FCF and EVA, respectively, see Lewin & Cachanosky, forthcoming, chapter 8, appendix and Cachanosky and Lewin (2014, p. 663) and Koller, Goedhart, and Wessels (1990, appendix B).

[13] This is another way to look at the intricacies of the maintenance of the capital of the firm (see Lewin & Cachanosky, 2019, section 5).

[14] It may help to remember that by "market value" we mean the price the entrepreneur imagines the firm would fetch in the market were it to be sold.

[15] The present value of the EVA in Period 5 would be: $CV_0 = f^4 \cdot \frac{EVA_5}{c}$, where $f^4 = \frac{1}{(1+c)^4}$ is the discount factor in Period 4.

[16] This is the situation, for instance, of firms such as Amazon reporting negative profits for a number of years while investing heavily in the value of the firm. Uber is currently reporting huge losses and investors' assessent of its CV depends on their expected *MVA* or *EVA* in the current and future period.

[17] In standard microeconomic analysis, Profit = *EVA* = *TR* − *TC*.

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