Early warning signs (value based) of imbalances in troubled firms

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The article describes the crucial role played by valuations in the diagnosis and early resolution phases, due to their ability to identify structural imbalances, regardless the accounting choices made by the troubled firm. In the early diagnosis of a crisis valuations are carried out for decision-making purposes. This means that it is necessary to have available several estimates that can express: the value that can be extracted from the use of the assets; the price that should be incurred to replace its assets; the price that could be fetched by selling it as a whole or by selling it piecemeal. The article gives few examples of financial and operating imbalances and their consequences on firm's value.

1. Business crisis

Insolvency is rarely a sudden event (generally it materializes as a combination of lower revenues and/or profits and a reduced operating efficiency), yet many businesses wake up exceedingly late to the need to restructure. Inertia has a cost. Timely restructuring actions can generate much more value and are more likely to succeed than restructuring activities undertaken when bankruptcy looms. The earlier the diagnosis of a business crisis, the greater the number of options available to address it and the more effective the actions taken.

In fact, if the operating and/or financial imbalance is dealt with promptly:

1) the probability of success of the corrective action is higher;

2) the corrective action is less drastic and incisive;

3) the stakeholders' confidence is not compromised;

4) corrective actions can be taken with positive long-term effects, without jeopardizing the firm' existence;

5) it might not be necessary to share the turnaround plan with lenders;

6) shareholders and management continue to exercise control over the activities.

As the crisis exacerbates, these conditions no longer hold and the turnaround may take longer, due to the simultaneous need: to share decision-making power with creditors; for more incisive actions to obtain faster results with respect to cash shortfalls; for management replacement etc. The longer the delay, the greater the amount of indirect distress costs and the greater the urgency to obtain effective results with the corrective action. The need for results in a short period of time, management replacement and the inability to adopt more far-reaching actions (at least in the early stages) entail in turn greater risks of failure.

Why do companies react late to a crisis if a delay is costly? Reasons might include weak management or management errors or lack of accurate and timely management information. Alternatively, management may not feel responsible for the downside as well as the upside and the deterioration may be due to the compounding of a series of small mistakes. In smaller firms, owners are often reluctant to accept reality because the business is an extension of their ego and acknowledging distress is tantamount to admitting one's errors. Another reason might be the deliberate attempt by management to hide the crisis not to incur indirect distress costs.

Whatever the reasons, however, it should be in the creditors' best interest to use monitoring and bonding tools capable of diagnosing a crisis sufficiently early and to prevent it. Actually, in many cases these tools are ineffective because performance measures are accounting-based, not value-based, and the deterioration of a company starts long before the problem shows up in the financial statements. This article intends to describe the crucial role played by valuations in the diagnosis and early resolution phases, due to their ability to identify structural imbalances, regardless of the accounting choices made.

However, these are special valuations. In fact, business valuations can serve different purposes, though they are all designed to achieve five main objectives:

- valuations to measure business performance. In these cases, a valuation is intended to estimate economic profit (or economic value added), taking as reference accounting-based measures of the firm;
- valuations for financial reporting. In these cases, the valuation is intended to estimate the fair value and or the value in use of a business;
- valuations for decision-making purposes. In these cases, the valuation is designed to compare value in

use with value in exchange of a business (hold vs. divest strategy);

- valuations for negotiation purposes. In these cases, the valuation is intended to express potential value (ask price) or value "as is" (bid price) of a business;
- valuations for transaction purposes. In these cases, the valuation is intended to express the market value of a business.

In the early diagnosis of a crisis valuations are carried out for decision-making purposes. This means that it is necessary to have available several estimates that can express: the value that can be extracted from the use of the company; the price that should be incurred to replace its assets; the price that could be fetched by selling it as a whole or by selling it piecemeal.

In most countries, insolvency laws encourage a consensual resolution of business crises. Valuations are the cornerstone of the entire restructuring process. However, both to access negotiated solutions and to manage the process under the protective shield of the insolvency law, valuations become the tool through which the parties negotiate to advance their interests. Thus, if management, shareholders and junior claimants are interested in overstating the benefits of the restructuring plan (plan value) and in understating forced liquidation value, senior creditors' best interests lie at the opposite end of the spectrum. Thus, when the crisis has emerged and negotiations get under way, estimates diverge radically because valuations are transformed from a decision-making to a bargaining tool. The conflicting interests of the different creditor categories give rise to biased valuations. There is evidence in the literature that valuations can differ to a significant extent[1], and in any case more than the valuation uncertainty related to troubled firms would warrant.

It is precisely the distortion of the valuations performed to support conflicting interests during a full-blown crisis that is considered by certain authors[2] the main reason for the failure of the systems that encourage the consensual reorganization of distressed firms. Many restructurings carried out under court supervision might just delay the liquidation of the firm, with resulting value destruction that an immediate auction sale of the distressed firm could have avoided. Thus, an auction would be the best way to fix the problem, as it would certify the true value of the firm without resorting to valuers[3].

This article focuses on valuations undertaken to diagnose a state of distress. The objective is to perform an early diagnosis of the distress, through objective valuations. If valuations when court protection is sought re the triumph of hope, valuations conducted to diagnose distress need to be realistic.

A good part of the literature on distressed firms concern companies that are in a full-blown crisis and, as

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[1] Stuart C. Gilson, Edith S. Hotchkiss, Richard S. Ruback, Valuation of Bankrupt Firms, The Review of Financial Studies, Spring 2000, Vol. 13, No. 1, pp. 43-74

[2] Michael C. Jensen "*Corporate control and the politics of finance*", Journal of Applied Corporate finance, 13-33 (Summer 1991). Jensen adopts the following classification for companies that reorganize under court supervision (chapter 11):

1. Companies with profitable operations but the "wrong" capital structures. In these cases the cash flow available to the company without compromising the company's profitability is lower than the payment obligations with claimants and a rescheduling of debt to match the cash flow generated from operating activities is necessary;

2. Companies with profitable operations whose value is being maximized under the current management team, but whose total firm value for reasons now beyond management's control is below the (nominal) value of total liabilities. In such cases, it is not enough to reschedule debt in a way that matches the cash flow from operating activities but it is necessary to reorganize the firm's financial structure, through the partial conversion of financial debt into equity and a dilution of the current shareholders and management;

3. Companies with potentially profitable, but poorly managed, operations that could meet their total obligations provided the firm's management team is changed and a restructuring is undertaken. In these cases the strategy is wrong and needs to be changed, together with the financial structure to provide adequate incentives to the new management team;

4. Companies that cannot meet their contractual obligations and whose liquidation value exceeds their going concern value. In these cases the company is worth more "dead" than "alive" and the liquidation must satisfy creditors on the basis of the priority of their claims (absolute priority rule).

Jensen's classification supports the Author's argument that the absolute priority rule is frequently violated, through claims awarded to shareholders and junior creditors (unsecured or subordinated) also when senior creditors receive partial settlements, due to the fact that "in-court" restructurings typically require:

a) leaving the current management team in place;

b) approval or reorganization plans by all creditor categories.

These restructuring methods end with the expropriation (at least in part) of senior creditors by shareholders (the debtors) and unsecured or subordinated creditors by setting off long attempted-restructuring processes, which result in higher distress costs and no real benefit. Jensen regards this circumstance also as the cause of debt capital rationing by parties that might be interested in restructuring the company.

[3] Not every author agrees with this view. There are two schools of thought regarding business insolvency:

a) The first school of thought considers insolvency the direct effect of competition and entrepreneurial dynamism, with companies that thrive and achieve success, on one side, and companies that are progressively marginalized through a creative destruction process, on the other. Anything that prevents companies from being pushed out of the market hurts competition. This school of thought takes its inspiration from laissez-faire economics and thinks that the loss of value for the stakeholders after a forced sale of the insolvent firm is lower than the costs that would be incurred to keep alive companies without viable market prospects;

b) The second school of thought, for its part, thinks that business crises are not necessarily due to competitive pressures, but might be originated from management errors (and more generally mismanagement), adverse cyclical phases, the loss of key employees, etc., that is circumstances that can be mostly remedied (if dealt with promptly). For this school of thought the death of companies that could be turned around would lead to an unnecessary loss for stakeholders; that's why it is necessary to draw a distinction between companies that can be restored to health and companies that cannot.

such, focuses on the causes of the distress, not on the early signs of the distress[4]. Yet, most troubled firms feature inadequate value-based performance measures, which might bring to light in a timely manner the signs of fundamental imbalances. As with medicine, the best care requires early diagnoses. Shortcomings in information systems are themselves a cause of distress, as they entail company inaction or otherwise an inordinately long period of time before necessary corrective actions are implemented. Only the early awareness of serious potential imbalances can make it possible to summon the energy necessary to meet challenges.

Since they are made for decision-making purposes, such valuations require a comparison between value in use and value in exchange and, as such, are founded on the estimation of different bases of value.

A troubled firm incurs indirect distress costs (loss of key employees, key customers, key suppliers, etc.). Indirect distress costs are reversible but their reversibility depends on the gravity of the distress. This means that, to diagnose the state of distress, value estimates must include the negative effects of indirect distress costs, unlike what happens when the valuation is conducted to estimate the potential value that the firm might attain as a result of a restructuring capable of removing indirect distress costs. In other words, it is necessary to separate the estimates for the diagnosis of distress from the estimates intended to calculate the expected value on the basis of the restructuring. The former includes indirect distress costs and the latter do not include them or otherwise project them as progressively falling.

2. Structural operating imbalance and structural financial imbalance

A correct diagnosis of corporate distress requires first of all the identification of the nature of the firm's imbalance. Accordingly, it is necessary to distinguish between structural operating imbalance and structural financial imbalance. Often the two overlap as companies experiencing serious operating distress are also experiencing financial distress and financially distressed firms sooner or later enter a state of operating distress (as financial difficulties affect operational choices).

For our purposes, the two concepts will be kept separate, at least initially.

Structural operating imbalance

Structural operating imbalance refers to the firm's inability to recover the value of its assets through their use. More simply, the firm experiencing a structural operating imbalance reflects badwill with respect to the replacement cost of its assets. In addition, the firm is unable to recover its maintenance capex (which, as such, represents investments with a negative net present value) through the cash flows and profits generated from operating activities. It is important to underscore that the focus is on the value in use of the firm's assets and the capital invested at replacement cost, not the capital invested originally by the firm.

In fact, there are two measures of invested capital:

i. Invested Capital (measured) at reproduction cost (or effective or historical invested capital) (IC_e), which is the original capital invested by the firm and is independent of its assets' earning power. Many companies in structural decline show an invested capital in excess of the earnings that they can extract from it, due to bad investment decisions made in the past or mismanagement or an industry crisis that reduced the original earning power of the assets in place. Effective invested capital is the historical cost of the firm's investments (net of consumption) and is a measure that reflects past choices (backward looking);

ii. Invested Capital (measured) at replacement cost (IC_{rc}), which represents the investment necessary to replace the assets currently used by the firm and depends on the earning power of such assets. Capital invested at replacement cost reflects the capital expenditure necessary for the firm to maintain unaltered its operating activities and differs from effective invested capital (reproduction cost) because it does not include all the excess costs incurred in the past, all the management errors made and expresses instead the highest and best use (HBU) of the assets from the perspective of market participants. In this sense, capital invested at replacement cost reflects the capital that the firm needs to run its business prospectively (forward looking). If the firm cannot generate an adequate return on capital invested at replacement cost it means that it cannot deploy its assets at their HBU. Capital invested at replacement cost is not the same as realizable value from the sale of assets, because it represents an entry price and not an exit price and because it is a price prevailing in an orderly market and not the price obtained by the firm as a result of a forced sale of its assets.

If in the past the firm made bad investment decisions or investments that did not result in the expected earning power (thus it incurred excess costs in the form of excess investment or costs too high for a specific investment), or if it was hit by an economic recession or an industry crisis that reduced the value of its assets, capital invested at replacement cost is lower than effective invested capital ($IC_{rc} < IC_e$). This is the most frequent situation for declining companies.

[4] Except for the strand of the literature that deals with corporate default forecasts pioneered by Robert Altman.

It is worth noting that effective invested capital and capital invested at replacement cost are not necessarily reflected by their book value, because the book value of invested capital does not include investments in intangible assets developed internally, on one side, and may have been written down, on the other.

The fact that effective invested capital (reproduction cost) is backward looking while capital invested at replacement cost is forward looking implies also that the returns calculated on the two different value bases reflect two different performance measures. In fact, one is backward looking in that it reflects a return based on past decisions (lower, to the extent that effective invested capital is greater than capital invested at replacement cost) and the other is forward looking and shielded from the consequences of past mistakes (typically higher, but still to the extent that effective invested capital is greater than capital invested at replacement cost). Consistently, the difference between the return on effective invested capital and cost of capital measures value created or destroyed with respect to past investments (and thus it is of no use for decision-making purposes) while the difference between the return on capital invested at replacement cost and cost of capital reflects the value that the firm can create or destroy on the basis of the current value of its assets (and can be used for decision-making purposes).

A firm exhibits a structural operating imbalance when the average expected return on capital invested at replacement cost is lower than its cost of capital.

It should be noted that the return on capital invested at replacement cost sterilizes the negative effects of two causes of distress:

a) macroeconomic or industry-related causes beyond the firm's control which reduce the replacement cost of assets;

b) bad investment decisions made in the past by the firm, which do not affect capital invested at replacement cost.

For this reason, in the case of distressed firms, the return on capital invested at replacement cost is always greater than the return on effective invested capital.

While it frees the company from past errors and the negative effects of adverse economic conditions, return on capital invested at replacement cost does not eliminate the negative effects of mismanagement.

Assets' replacement cost expresses the fair market value of assets, thus their highest and best use (HBU)[5] which, in case of economic or industry-related crisis, reflects the deteriorated conditions of the general economy. Accordingly, if the firm is unable to generate a return equal to or greater than cost of capital, despite the sterilization of the negative effects coming from an external source or due to past choices, it means that:

- the firm is unable to deploy its assets at their HBU in their new conditions of use;
- the firm will not be able to replace its assets (at the end of their remaining useful lives), as the new investment entails value destruction (negative net present value);
- the enterprise value is lower than assets' replacement cost (Q ratio lower than 1).

Earlier in the paper it has been mentioned that an imbalance results from a difference in values. In this case the difference concerns the capital invested at replacement cost and enterprise value (calculated on the basis of the specific entity's expected stream of economic benefits). When enterprise value is lower than capital invested at replacement cost the company features a structural operating imbalance, as it is unable prospectively to preserve the value of its assets and thus to recover the investments necessary to continue to operate. The firm is in a structural imbalance as it destroys value prospectively, not because it destroyed value in the past.

Structural financial imbalance

Financial imbalance concerns instead choices made in the past and the destruction of effective invested capital that has already occurred (due to management errors, adverse economic conditions or mismanagement). The loss of value refers in this case to effective invested capital and the way in which the firm is funded. A firm experiencing a financial imbalance exhibits an enterprise value lower than the face value of its debt, from which it follows that its equity is out of the money[6].

This can be seen clearly in the case of real estate or shipping companies (i.e. companies that invest in assets with an active secondary market) that in the past purchased real estate or ships at high prices (due to a phase of industry growth), leveraging their assets extensively. If the loss of value of the firm's assets (purchased in the past) exceeds equity, the value of such assets will be lower than the face value of the firm's debt and the company is in a structural financial imbalance.

If the destruction of value is due to past management errors or adverse economic conditions, the enterprise value might be greater than capital invested at replacement cost. This is why financial imbalance is con-

[5] Typically, the market value of assets adapts to the normal prospective earning power of the market participant (a strategic buyer). If the specific firm is unable to generate normal prospective earnings from the assets in question it means that it is unable to keep up with the profits that other market participants might extract.

[6] In fact, if the firm's equity is considered as a call option written on the value of the EV of a functioning business, with an exercise price equal to the face value of the firm's debt (D), when EV of a functioning business < D, the call option is out of the money.

ceptually different from structural operating imbalance. In theory, the firm experiencing a financial imbalance can express goodwill in relation to capital invested at replacement cost.

The circumstance that in actual reality financial imbalance often goes hand in hand with structural operating imbalance is due to indirect distress costs. The firm experiencing a financial imbalance is considered riskier by its stakeholders, as it is financially insolvent. This entails a deterioration of the terms of trade with customers, suppliers, employees and lenders, with the resulting decline in profitability. To a certain extent, indirect distress costs are reversible as, by rebalancing the firm's financial structure (for example by converting part of the debt into equity), the insolvency risk falls away and the terms of trade of the firm can improve. This is why the enterprise value of firms in distress is never independent of its financial structure. Enterprise value can be lower than capital invested at replacement cost because enterprise value suffers from indirect distress costs while assets' replacement value reflects the recoverable amount on the basis of the assets' HBU. As the firm approaches the insolvency zone (i.e. enterprise value slightly greater than the face value of debt) it begins to be saddled with indirect distress costs.

This is why financial restructurings (even though they concern only the financial structure) - which eliminate, in whole or in part, indirect distress costs - can enhance substantially enterprise value. By sterilizing the negative effects of indirect distress costs, enterprise value calculated on the basis of normalized profits expresses the potential value that the firm can recover once it is restructured financially.

The materialization of indirect distress costs is the first symptom of business crisis: the loss of key employees, key customers, key suppliers etc. are a proxy of a company decline which in turn results in a loss of earning power. One of the main reasons why distress is addressed late is due precisely to the underestimation of the indirect distress costs. The loss of key employees, key customers, key suppliers is often regarded as a one-time negative event, while in the absence of restructuring actions indirect distress costs can only increase, thereby accelerating the company downfall. This is why to diagnose the real state of distress of a firm it is necessary not to sterilize the negative effects of indirect distress costs.

3. A few examples

Below, examples are provided to show the differences in relation to three cases, structural operating imbalance, structural financial imbalance and a combination of operating and financial imbalances. For the sake of simplicity, the examples exclude tax effects and assume cash flow from operating activities as equal to EBITDA (no change in working capital and no maintenance capex).

Structural operating imbalance

Suppose a firm has effective invested capital of 100, represented by a single asset with a remaining useful life of four years, which was financed with debt equal to 40% of the asset's value (= 40% x 100 = 40). Suppose also that due to external negative events the asset's replacement value is 60 (i.e. historical cost reflects excess cost in the amount of 40). A structural operating imbalance is predicated on a return on capital invested at replacement cost lower than cost of capital. The example assumes that this return (ROIC) is 3% in each of the four year of the asset's remaining life and that the cost of capital (WACC) is 6%. The consequence is that the enterprise value (hereinafter EV) (= 56) is lower than the capital invested at replacement cost (60).

The example assumes also that the debt is repaid in equal instalments (10 per annum for four years) and that the cost of debt is 4% of the remaining capital at the beginning of each year. Lastly, it is assumed that the cost of debt reflects the borrower's credit standing[7] (this assumption will be removed in the next example) and that, as such, the market value of the debt is the same as its book value (= 40).

If EV is equal to 56 and the value of the debt is 40, the current equity value is 16 (= 56 – 40). Since the firm's effective invested capital is 100 and its debt (loan-to-value) is 40%, the original equity investment by the shareholders was 60, which is also the book value of equity. The destruction of value of the original equity investment – i.e. 44 (= 60 – 16) – reflects the destruction of the firm's effective invested capital (= 100 – 56 = 44).

In accounting terms, a firm in this situation might:

a) keep the asset at historical cost (=100). In this case, the annual depreciation would be 25 (=100/4) and would entail accounting losses. The initial equity of 60 would drop to 20.5 after four years and would reflect the cash available to shareholders (FCFE);

b) write down the asset by aligning its value to the current replacement cost (=60). In this case the initial equity would decrease by 40 (= difference between asset replacement cost and historical cost = 60 – 100). The annual depreciation of the asset would decline to 15 (=60/4) and would return the firm to slight profitability. After the initial decrease, equity would be

[7] This might be the case where the loan agreement has covenants that the firm has breached, with the resulting renegotiations of the original terms and conditions to reflect the issuer's greater risk.

now 20 (= 60 – 40) and would rise to 20.5 after four years, reflecting once again the cash available to the shareholders;

c) write down the asset aligning it to the EV (= 56). In this case the initial equity would decrease by 44 (difference between EV of the functioning business and historical cost = 56 – 100). In this case the asset's annual depreciation would fall to 14 (=56/4) and would cause the firm to be even more profitable than in the previous case. After the initial decrease, equity would be now 16 (= 60 – 44), would rise to 20.5 at the end of the fourth year and would correspond once again to cash available to the shareholders.

The example shows that operating imbalances do not necessarily mean that the firm operates at a loss. In fact:

- Reported results depend on the choice to spread the loss over time or to recognize the full amount of the loss early, so as to return rapidly the company to profitability (earnings management);
- In solutions b) and c), following the original write-down, the fact that the company recorded an accounting profit does not mean that it restored its operating health.

Thus, financial statements provide a distorted picture of the real situation of the firm.

Whatever the accounting solution adopted, at the end of the fourth year, if it wants to continue to operate, the firm needs to refinance the capital invested at replacement cost (=60) but without the original creditworthiness. In fact, even assuming that the firm can borrow funds for up to the original loan-to-value ratio (40%), the company could receive from its lenders 24 (= 40% x 60). Cash available would be 20.5 and the firm would be forced to ask its shareholders to inject fresh equity for the difference (= 15.5 = 60 – 24 – 20.5). The shareholder would hardly be willing to provide more capital to a firm that:

- destroyed value equal to 66% of the initial equity (= 20.5/60 – 1);
- continues to generate a return on capital invested at replacement cost (= 60) lower than its cost of capital. Following the purchase of the new asset at replacement cost (= 60), and since the firm is unable to provide a return in line with the cost of capital (3% vs. 6%), the enterprise value right after the purchase of the asset would decline to 56, with a value destruction equal to 11% of equity post capital increase [= (56-60)/(20.5+15.5)] and equal to 25% of the new equity injection [=(56-60)/15.5].

Table 1. Example of firm experiencing operating imbalance (with cost of debt in line with credit standing of the firm)

Years	0	1	2	3	4	Cumulative
Original Invested capital @reproduction cost (IC_e)	100	100	75	50	25	
Invested capital @replacement cost (IC_{rc})	60	60	45	30	15	
EBITDA (= UFCF)		16,8	16,35	15,9	15,45	
Depreciation @replacement cost		15	15	15	15	
Ebit (net of depreciations @replacement cost = $EBIT_{rc}$)		1,8	1,35	0,9	0,45	
ROIC @replacement cost = $EBIT_{rc}/IC_{rc}$ BoP		3%	3%	3%	3%	
Depreciations @reproduction cost		25	25	25	25	
Ebit (net of depreciations @reproduction cost = $EBIT_e$)		-8,2	-8,7	-9,1	-9,6	
ROIC @ reproduction cost = $EBIT_e/IC_e$		-8%	-12%	-18%	-38%	
WACC	6,00%					
Discount factor		0,943	0,890	0,840	0,792	
PV UFCF @wacc		15,8	14,6	13,3	12,2	
EV	56,0					
Loan-to-value (Leverage)	40%					
Debt	40	40	30	20	10	
Repayment of principal		10	10	10	10	
Cost of debt	4%					
Interest expenses		1,6	1,2	0,8	0,4	
NI @reproduction cost ($EBIT_e$ - Interest expenses)		-9,80	-9,85	-9,90	-9,95	
NI@replacement cost ($EBIT_{rc}$ - Interest expenses)		0,20	0,15	0,10	0,05	
Depreciation @ IC = EV		14	14	14	14	
EBIT (net of depreciations@IC=EV)		2,80	2,35	1,90	1,45	
NI @ IC = EV		1,20	1,15	1,10	1,05	
FCFE = UFCF - repayment of principal - interest expenses		5,2	5,15	5,1	5,05	20,5
Cost of equity	10,9%					
Discount factor		0,902	0,813	0,733	0,661	
PV FCFE @coe		4,69	4,19	3,74	3,34	
Equity value	16,0					
Original equity = Invested capital @reproduction cost - debt	60					
Equity value destroyed	-44,0					
Book Value of Equity w/o write off (EoP)	60	50,2	40,4	30,5	20,5	
Book Value of Equity w/write off (=IC_{rc})	20	20,2	20,4	20,5	20,5	
Book value of equity w/write off (= EV)	16,0	17,2	18,3	19,4	20,5	

Below, the case illustrated above is discussed after removing the (not too realistic) assumption that the terms and conditions governing the loan agreement are in line with credit standing of the firm. Since the firm purchased the asset for 100, with debt for 40, it destroyed value and saw its creditworthiness inevitably deteriorate. The original interest rate on the debt is lower than the firm's marginal cost of debt.

The same data as the previous case apply: a single asset with a remaining useful life of four years; historical cost of 100; asset value at replacement cost 60; return on capital invested at replacement cost equal to 3%; debt equal to 40 with an original interest rate of 4%.

Compared to the previous case, it is assumed that the lender has not been able to adjust the cost of capital to reflect the greater risk.

More realistically with respect to the previous case, it is assumed that the higher risk attributable to the firm translates into a higher cost of capital (= WACC = 10% vs. 6% in the previous example), hence a lower EV (51.3 vs. 56). EV is 4.7 lower than in the previous case (=51.3 – 56). The greater loss of value compared to the previous example does not reflect in this case entirely on the equity but also on the debt. In fact, if the cost of debt is contractually set (4%) and the lender could not adjust it to reflect the greater risk (which would result in a higher cost of debt, in the example 6%), the current value of the debt will be 1.78 lower than its face value (= 38.22 – 40). Also equity is lower than in the previous case (=13.08 vs. 16), but its loss of value (= 2.92) is lower than the loss of value of the asset (= 4.7) by an amount exactly equal to the loss of value of the debt (= 1.78 = 4.7 – 2.92). Given that, compared to the previous example, only discount rates changed but not the contractual cost of debt and the cash flow from operating activities, at the end of the fourth year the firm has the same amount of cash on hand as that of the previous example. Since the value destroyed was greater, the firm is faced with an even greater challenge to refinance the investment and continue the activity.

Table 2. Example of firm experiencing operating imbalance (with debt settlement not in line with credit standing of the firm)

Years	0	1	2	3	4	
Original Invested capital @reproduction cost (IC_e)	100	100	75	50	25	
Invested capital @replacement cost (IC_{rc})	60	60	45	30	15	
EBITDA (= UFCF)		16,8	16,35	15,9	15,45	
Depreciations @replacement cost		15	15	15	15	
Ebit (net of depreciations @replacement cost = $EBIT_{rc}$)		1,8	1,35	0,9	0,45	
ROIC @replacement cost = $EBIT_{rc}/IC_{rc}$ BoP		3%	3%	3%	3%	
Depreciations @reproduction cost		25	25	25	25	
Ebit (net of depreciations @reproduction cost = $EBIT_e$)		-8,2	-8,7	-9,1	-9,6	
ROIC @ reproduction cost = $EBIT_e/IC_e$		-8%	-12%	-18%	-38%	
WACC	10,00%					
Discount factor		0,909	0,826	0,751	0,683	
PV UFCF @wacc		15,3	13,5	11,9	10,6	
EV	51,3					
Loan-to-value (Leverage)	40%					
Debt	40	40	30	20	10	
Repayment of principal		10	10	10	10	
Cost of debt (nominal)	4%					
Interest expenses		1,6	1,2	0,8	0,4	
cost of debt (market rate)	6,0%					
Discount factor		0,943	0,890	0,840	0,792	
PV (repayment of principal and interest expenses)		10,943	9,968	9,068	8,238	
Market value of debt	38,22					
NI @reproduction cost ($EBIT_e$ - Interest expenses)		-9,80	-9,85	-9,90	-9,95	
NI @replacement cost ($EBIT_{rc}$ - Interset expenses)		0,20	0,15	0,10	0,05	
Depreciation @ IC = EV		12,83	12,83	12,83	12,83	
EBIT (net of depreciations@IC=EV)		3,98	3,53	3,08	2,63	
NI @ IC = EV		2,38	2,33	2,28	2,23	
FCFE = UFCF - repayment of principal - interest expenses		5,2	5,15	5,1	5,05	
Cost of equity	20,9%					
Discount factor		0,827	0,685	0,566	0,469	
PV FCFE @coe		4,30	3,53	2,89	2,37	
Equity value	13,08					
Original equity = Invsted capital @reproduction cost - debt	60					
Equity value destroyed	-46,9					
Book Value of Equity w/o write off (EoP)	60	50,2	40,4	30,5	20,50	
Book Value of Equity w/write off (=IC_{rc})	20,0	20,2	20,4	20,5	20,50	
Book value of equity w/write off (= EV)	13,1	15,46	17,78	20,06	22,28	
Difference between face value of debt and market value of debt					1,78	= 40 - 38,22
Book value of equity w/wiite off (= EV) and market value of debt					20,50	

Financial imbalance

This example has the same elements as the initial example but with a number of changes. The unchanged elements are as follows: a single asset with a remaining useful life of four years; historical cost of 100; asset value at replacement cost 60; cost of capital (WACC) 6%. Unlike the initial example, in this case the following assumptions hold:

- return on invested capital (at replacement cost) is equal to 8% and is, as such, greater than the cost of capital (WACC) of 6%
- the original loan-to-value ratio is 70%.

The consequence is that EV is greater than capital invested at replacement cost (= 63.1 vs. 60) but lower than the face value of debt (= 63.1 < 70 = 70% x 100). Thus, even though it destroyed value (EV < original invested capital), the firm is not in a structural operating imbalance, given that when it will be called upon to refinance the investment at replacement cost it will be able to generate a return greater than its cost of capital. The problem in this case is that the firm financed the initial investment with much higher leverage than in the previous example (70% vs. 40%), which means that the face value of the current debt of 70 (= 100 x 70%) is greater than the firm's EV. The table shows that this circumstance results in a negative cash flow for the shareholders in each of the four years of the asset's remaining life, thus making the business unsustainable unless the shareholders make up for the cash shortfall (4.5) and refinance the new investment to keep the firm operational. In this case, shareholders are expected to step in, given that prospectively they are in a position to generate value (by investing 60 they have assets worth 63.1).

Table 3. Example of firm in financial imbalance

Years	0	1	2	3	4	Cumulative
Original Invested capital @reproduction cost (ICe)	100	100	75	50	25	
Invested capital @replacement cost (ICrc)	60	60	45	30	15	
EBITDA (= UFCF)		20	18,75	17,5	16,25	
Depreciations @replacement cost		15	15	15	15	
Ebit (net of depreciations @replacement cost = $EBIT_{rc}$)		5	3,75	2,5	1,25	
ROIC @replacement cost = $EBIT_{rc}/IC_{rc}$ BoP		8%	8%	8%	8%	
Depreciations @reproduction cost		25	25	25	25	
Ebit (net of depreciations @reproduction cost = $EBIT_e$)		-5,0	-6,3	-7,5	-8,8	
ROIC @ reproduction cost = $EBIT_e/IC_e$ iniziale		-5%	-8%	-15%	-35%	
WACC	6,00%					
Discount factor		0,943	0,890	0,840	0,792	
PV UFCF @wacc		18,9	16,7	14,7	12,9	
EV	63,1					
Loan-to-value (Leverage)	40%					
Debt	70	70	52,5	35	17,5	
Repayment of principal		17,5	17,5	17,5	17,5	
Cost of debt	4%					
Interest expenses		2,8	2,1	1,4	0,7	
NI @reproduction cost ($EBIT_e$ - Interest expenses)		-7,80	-8,35	-8,90	-9,45	
NI @replacement cost ($EBIT_{rc}$ - Interest expenses)		2,20	1,65	1,10	0,55	
Depreciation @ IC = EV		15,78	15,78	15,78	15,78	
EBIT (net of depreciations@IC=EV)		4,22	2,97	1,72	0,47	
NI @ IC = EV		1,42	0,87	0,32	-0,23	
FCFE = UFCF - repayment of principal - interest expenses		**-0,3**	**-0,85**	**-1,4**	**-1,95**	**-4,5**

Financial imbalance and structural operating imbalance

The last example illustrates a situation of operating and financial imbalance, that is a situation where EV is lower than both the face value of debt and capital invested at replacement cost (IC_{rc}).

The example uses the same data as the previous case, except for the return on capital invested at replacement cost which is set at 3% (as opposed to 8% in the previous example). As the cost of capital (WACC) is 6%, EV is lower than both capital invested at replacement cost (56 vs 60) and the debt raised to purchase the asset at the original cost (70 = 100 x *Loan-to-value* = 100 x 70%). The consequence is that the firm generates lower cash flows from operating activities (as in the example there is no change in working capital or maintenance capex, the cash flow from operating activities is equal to EBITDA) and, with the same amount of debt, has a higher financial imbalance (in terms of cash flows available to the shareholders). In fact, if in the previous example the cumulative cash shortfall was 4.5, in this example it increases to 12.5. The difference with the previous example is that EV is lower than the assets' replacement cost and the shareholders have no interest in making up for the cash shortfall.

Table 4. Example of firm in operating and financial imbalance

Years	0	1	2	3	4	Cumulative
Original Invested capital @reproduction cost (IC_e)	100	100	75	50	25	
Invested capital @replacement cost (IC_{rc})	60	60	45	30	15	
EBITDA (= UFCF)		16,8	16,35	15,9	15,45	
Depreciations @replacement cost		15	15	15	15	
Ebit (net of depreciations @replacement cost = $EBIT_{rc}$)		1,8	1,35	0,9	0,45	
ROIC @replacement cost = $EBIT_{rc}/IC_{rc}$ BoP		3%	3%	3%	3%	
Depreciations @reproduction cost		25	25	25	25	
Ebit (net of depreciations @reproduction cost = $EBIT_e$)		-8,2	-8,7	-9,1	-9,6	
ROIC @ reproduction cost = $EBIT_e/IC_e$ iniziale		-8%	-12%	-18%	-38%	
WACC	6,00%					
Discount factor		0,943	0,890	0,840	0,792	
PV UFCF @wacc		15,8	14,6	13,3	12,2	
EV	56,0					
Debt	70	70	52,5	35	17,5	
Repayment of principal		17,5	17,5	17,5	17,5	
Cost of debt	4%					
Interest expenses		2,8	2,1	1,4	0,7	
NI @reproduction cost ($EBIT_e$ - Interest expenses)		-11,00	-10,75	-10,50	-10,25	
NI @replacement cost ($EBIT_{rc}$ - Interest expenses)		-1,00	-0,75	-0,50	-0,25	
Depreciation @ IC = EV		14,00	14,00	14,00	14,00	
EBIT (net of depreciations@IC=EV)		2,80	2,35	1,90	1,45	
NI @ IC = EV		0,00	0,25	0,50	0,75	
FCFE = UFCF - repayment of principal - interest expenses		**-3,5**	**-3,25**	**-3**	**-2,75**	**-12,5**

3. The different degrees of structural imbalance

A diagnosis of a firm's distress starts with the comparison between enterprise value (estimated on the basis of prospective earning power) and four (asset-based) value metrics:

a) Original invested capital. If Enterprise Value is lower than effective invested capital (but greater than capital invested at replacement cost and the face value of debt), the firm destroyed value (underperforming firm), but did not jeopardize its operating and financial balance;

b) Capital invested at replacement cost. If Enterprise Value is lower than capital invested at replacement cost the firm is in a structural operating imbalance (stressed firm);

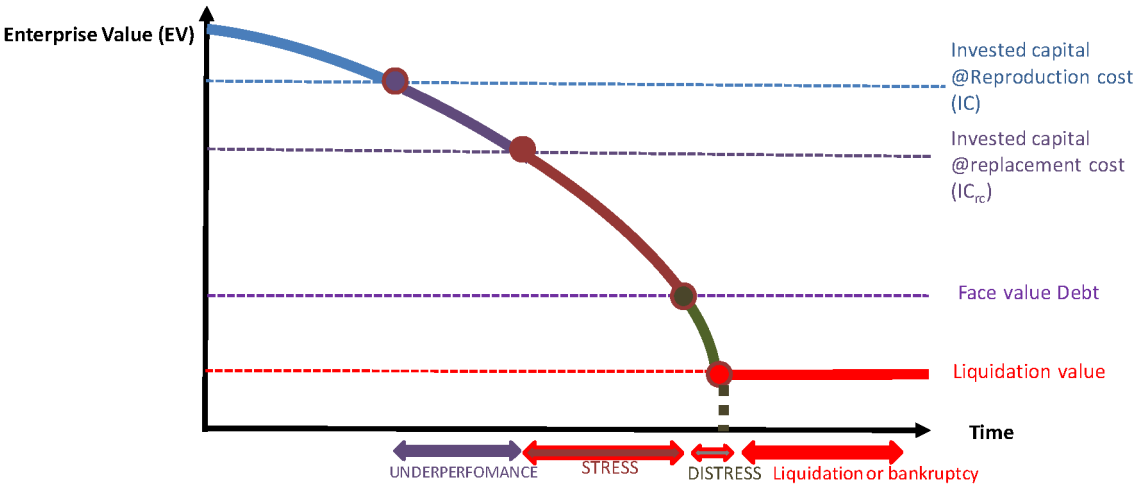
c) Face value of debt. If Enterprise Value is lower than the face value of debt the firm is in a financial imbalance (distressed firm);

d) Liquidation value. If Enterprise Value is lower than liquidation value the firm is no longer a going concern (gone concern).

As the face value of debt can exceed the assets' replacement cost, the firm can be distressed but not stressed.

Figure 1 shows the changes in enterprise value in the final phases of a firm's lifecycle, from maturity, when the firm still generates value but starts to lose its competitive advantage, to liquidation (ceases to exist).

Figure 1. The different degrees of structural imbalance: from underperformance to liquidation



The chart depicts Enterprise Value on the vertical axis and time on the horizontal axis and exhibits the four categories of firms described previously and defined in essence as underperforming, stressed, distressed and in a liquidation state. The different firm categories are identified on the basis of the comparison between enterprise value and four different thresholds of decreasing value, represented in the chart by as many horizontal broken lines.

Special emphasis is placed on the relationship between capital invested at replacement cost and liquidation value. Capital invested at replacement cost expresses the value of the firm's assets at their highest and best use (physically, legally, and financially achievable by market participants) and represents the entry price that the firm should incur to upgrade its assets to carry out business activities. Capital invested at replacement cost expresses the market value of assets that the firm utilized in its operations. Liquidation value is instead an exit price characterized by a forced sale and can refer to the firm as a whole or to the individual assets. The difference between capital invested at replacement value and liquidation value indicates the value lost when senior creditors force the liquidation of a company that should have been kept operational[8].

The chart shows how enterprise value diminishes at an increasingly faster rate. Unless corrective action is taken, the graver the structural decline phase the faster the loss of enterprise value. Each of the four decline phases identified in the chart reflects a situation of imbalance that, due to its nature, cannot persist over time. If it is not addressed it can only deteriorate. The loss of value is accelerated by the so-called indirect distress costs. These are the negative effects that normally hit firms in structural decline as a result of the reaction of employees, customers, suppliers and competitors to the firm's troubles. Such reaction can take shape in many different ways: from the loss of talent to the lack of financial resources to grasp opportunities or to react to competition, to the loss of key suppliers or customers, to the inability to bid for contracts, etc.[9].

Chart 2 shows the case where the face value of debt is greater than the capital invested at replacement cost. This occurs when the firm is leveraged to the tilt to finance its effective invested capital (at historical reproduction cost). In these cases it is enough for enterprise value to fall even slightly below the effective invested capital to drive the firm to insolvency.

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[8] Replacement cost represents the market value of a firm's assets. "Market value (...) has no applicability in the forced-sale context: indeed, it is the very antithesis of forced-sale value.

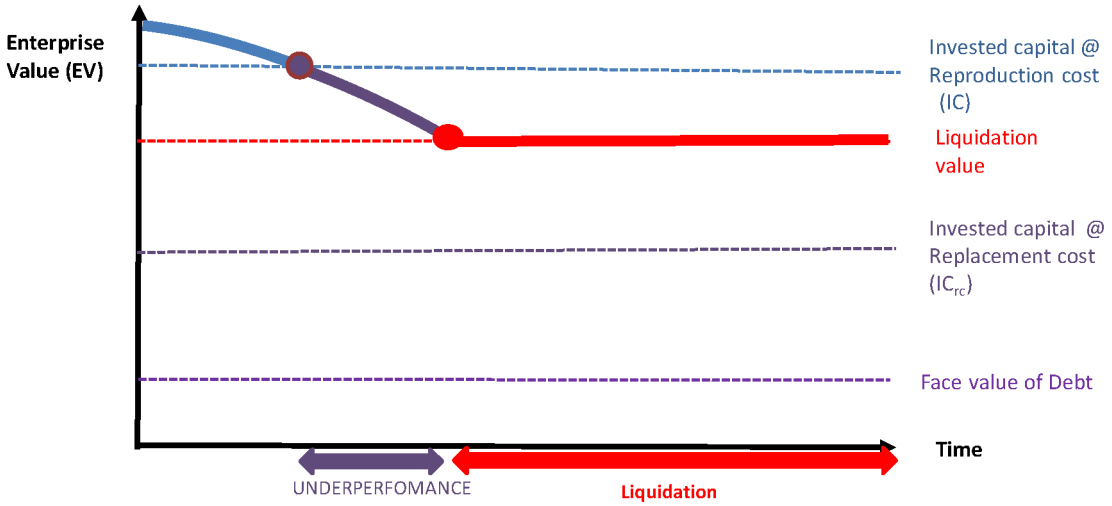
Comparing the conditions of a forced sale with the conditions viewed as necessary for markets to function efficiently helps one understand why a forced-sale price is likely to represent a significant discount from an asset's fair market value. First, unlikely a voluntary sale, under a forced sale the seller and/or buyer is not a willing participant in the transaction, so he or she cannot be described as "typically motivated". Second, the buyer at a forced sale is often not very informed about the property being sold. In many instances, prospective buyers have insufficient time to gather quality information about the property being sold. In other instances, the sale procedures those conducting the sale must follow by court order or by statute effectively prevent prospective buyers from gathering the type of information one would gather if the property were being sold on the open market" Thomas W. Mitchell, Stephen Malpezzi, Richard K. Green, Forced Sale risk: class, race and the double discount, in *Florida State University Law Review*, 2010, Vol. 37, Issue 3, pp. 589-658.

[9] The literature defines distress costs as all the costs directly attributable to the firm's distress (advisory and legal costs) and the indirect costs represented by the loss of customers, suppliers, employees, and business opportunities typically experienced by troubled firms. Indirect distress costs relate to the stakeholders' reaction to the firm's distress and are one of the drivers of the downfall and the operating and financial imbalances.

Distress costs rise with the increase of the difficulties of the firm and the probabilities of the firm's liquidation. For this reason the management of a declining firm may be led to delay the adoption of drastic restructuring or turnaround action, fearing that knowledge of the distress might give rise to indirect distress costs capable of accelerating the firm's decline. This is a very common behaviour which is often the first obstacle to timely restructuring action.

A key feature of distress costs is the fact that they may be reduced significantly, or even eliminated, by the adoption of credible restructuring plans. This is a particularly important circumstance in the valuation of a reorganized firm, as the removal of indirect distress costs is one of the main benefits associated with the restructuring.

Figure 2. The different degrees of structural imbalance when the face value of debt exceeds the assets' replacement value



More generally, it can be said that the distance between the four value thresholds (invested effective capital, capital invested at replacement value, face value of debt and liquidation value) depends on the causes of the business distress. The reasons can be seen by way of example.

Consider three firms affected by three different types of problem:

a) past overinvestment (overexpansion, acquisition problems, overdiversification, etc.) by a firm with high asset specificity and a financial structure in line with the industry average;

b) Industry crisis (business cycle), suffered by a firm with low asset specificity and very high leverage;

c) mismanagement (marketing weaknesses, customer and product focus problems, indecisiveness in adapting assets to new technologies, etc.) by a company with low asset specificity and a financial structure in line with the industry average.

but with the same:

i. original invested capital (IC_e), in the amount of €70 million;

ii. five alternative scenarios in terms of earning power. In particular, scenarios are assumed with a progressively falling ability to generate EBITDA (from €15 million in scenario 1 to €1 million under scenario 5);

iii. enterprise value, which varies in relation to each scenario on the basis of a constant EV/EBITDA multiple, i.e. 5x. Thus, the spectrum of the enterprise value ranges from €75 million (= 15 x 5) under scenario 1 to €5 million (= 1 x 5) under scenario 5. Enterprise value is lower than invested effective capital for all the scenarios, except scenario 1.

The three firms differ in terms of invested capital at replacement cost, face value of debt and liquidation value, in relation to the different causes of troubles. In fact:

a) In the case of the firm with past overinvestment it was assumed that:

- Invested Capital at replacement cost equals 60% of effective invested capital (which includes overinvestment);
- Liquidation value is 15% of the capital invested originally (thus expressing a substantial discount to the assets' replacement value due to the high specificity of the assets);
- The face value of debt is 50% of the capital invested originally (equal to the average loan-to-value ratio of the industry).

b) In the case of overall industry crisis it was assumed that:

- Invested capital at replacement cost equals 40% of the capital invested originally (due to the crisis that hit the industry, the assets' reduced earning power for all the companies in the industry translates in a steeped decline of their market price);
- Liquidation value is equal to 30% of the capital invested originally (due to the high substitutability/low specificity of the firm's assets, the liquidation value reflects a lower discount to the assets' replacement value);
- The face value of debt is 70% of the capital invested originally (= *Loan-to-Value* reflects a measure close to the industry average, before the crisis, and is higher in relation to the assets that are more readily realizable).

c) In the case of mismanagement, it was assumed that:

- Invested Capital at replacement cost equals 80% of the capital invested originally (as the crisis is due to mismanagement, the assets' replacement value is closer to their original cost);
- Liquidation value is equal to 70% of the capital

invested originally (also in this case, due to mismanagement the assets' liquidation value is slightly lower than their replacement cost);

- The face value of debt is 50% of the capital invested originally (= *Loan-to-Value* in in line with the average for the industry).

The table 5 identifies the nature of the imbalances of each firm, in relation to the five different scenarios.

Table 5. Three troubled firms for different reasons (overinvestment, business cycle, mismanagement) in five different scenarios

Five scenarios						
	Scenarios	*1*	*2*	*3*	*4*	*5*
Ebitda		15	10	8	4	1
EV/Ebitda multiple		5	5	5	5	5
EV		**75**	**50**	**40**	**20**	**5**
A) Overinvestment						
	% of original invested capital					
IC_e (Invested Capital @reproduction cost)	100%	70	70	70	70	70
IC_{rc} (Invested Capital @ replacement cost)	60%	42	42	42	42	42
Liquidation value	15%	10,5	10,5	10,5	10,5	10,5
Face value of debt	50%	35	35	35	35	35
relation between EV and value thresholds		*$EV>IC_e$*	*$IC_e>EV>IC_{rc}$*	*$IC_{rc}>EV>$ Face value debt*	*Face value debt$>IC_{rc}>EV$*	*$EV<$Liquidation value*
		health firm	underperforming firm	stressed firm	stressed and distressed firm	liquidation
B) Business Cycle						
	% of original invested capital					
IC_e (Invested Capital @reproduction cost)	100%	70	70	70	70	70
IC_{rc} (Invested Capital @ replacement cost)	40%	28	28	28	28	28
Liquidation value	30%	21	21	21	21	21
Face value of debt	70%	49	49	49	49	49
relation between EV and value thresholds		*$EV>IC_e$*	*$IC_e>EV>IC_{rc}$*	*Face value debt$>EV>IC_{rc}$*	*$EV<$ Liquidation value*	*$EV<$liquidation value*
		healt firm	underperforming firm	distressed firm	liquidation	liquidation
C) Mismanagement						
	% of original invested capital					
IC_e (Invested Capital @reproduction cost)	100%	70	70	70	70	70
IC_{rc} (Invested Capital @ replacement cost)	80%	56	56	56	56	56
Liquidation value	70%	49	49	49	49	49
Face value of debt	50%	35	35	35	35	35
relation between EV and value thresholds		*$EV>IC_e$*	*$EV<IC_{rc}$*	*$EV<$ Liquidation value*	*$EV<$ Liquidation value*	*$EV<$ Liquidation value*
		healt firm	stressed	liquidation	liquidation	liquidation

Table 5 shows that:

1) Under Scenario 1 (best): when EBITDA is equal to 15, all three firms create value. They have the same EV (=75 = 15 x 5) higher than the (same) original invested capital (=IC_e= 70);

2) Under Scenario 2: when EBITDA is equal to 10, given the same EV (=50 = 10 x 5), the firm that overinvested in the past and the firm in the industry in crisis underperform ($IC_e>EV>IC_{rc}$), while the mismanaged firm is already stressed ($EV<IC_{rc}$);

3) Under Scenario 3: when EBITDA is equal to 8, given the same EV (=40 = 8 x 5), the firm that overinvested in the past is stressed ($EV<IC_{rc}$), the firm in the industry in crisis is distressed (Debt>EV>ICcr), while the mismanaged firm is already in liquidation (EV<Liquidation value);

4) Under Scenario 4: when EBITDA is equal to 4, given the same EV (= 20 = 4 x 5) the firm that overinvested in the past is distressed (Face value of debt > IC_{rc}>EV), the firm in the industry in crisis and the mismanaged firm are in liquidation

5) Under Scenario 5: when EBITDA is equal to 1, given the same EV (= 5), all three firms are in liquidation.

4. Zombie and distressed firms

So far it has been shown how valuation can be used as a tool to diagnose a business crisis, but not how the crisis can evolve.

Moving from the diagnosis of a business crisis to the identification of solutions, valuation must act as a decision-making tool. To that end, it is necessary to distinguish between firms that can be turned around and firms that cannot be turned around. However, this difference is an excessive simplification for two main reasons:

a) many distressed firms are still kept in operation as, even though they destroy value, they are worth more alive than dead (i.e. zombie firms);

b) firms can be restored to health when it is more likely than not that their restructuring is successful, though such an outcome is far from certain. This involves that even if enterprise value is lower than the face value of debt, equity has value and its value is greater than the implied discount of the current value of debt to its face value.

Let us see why.

Zombie firms

A structural operating imbalance should not be sustainable over time as the firm not only is unable to recover the invested capital (at replacement cost) but it is also unable to recover the investments necessary to continue to operate. Yet, many firms with a structural imbalance continue to survive. They are called zombie firms.

A zombie firm is a business with a structural operating imbalance featuring all of the following:

a) its enterprise value is greater than its forced-sale value, as often the forced-sale value is close to zero;

b) continuing operations until the end of the remaining useful life of its assets (without maintenance capex) allows the recovery of more invested capital than it would be possible with a forced sale;

c) when continuation of operations without maintenance capex is not an option and a forced sale entails a significant loss of value, continuing business operations for an indefinite period of time by making the necessary maintenance capex might be a preferable alternative, even though capex entails further value destruction (investments with a negative net present value);

d) restructuring of the firm requires zero net present value investments. In this way, the firm can be turned around, though without benefits in terms of enterprise value vis-à-vis continuation of operations until the end of the assets' remaining useful life (without maintenance capex).

Table 5 shows these different cases. The table consists of two sections. The first shows a firm without any imbalance, with an enterprise value equal to invested capital at replacement cost (no goodwill, no badwill). The replacement cost is 100 and two different situations are compared which return the same enterprise value (100):

a) Finite life perspective. In this case, the firm does not incur maintenance capex and produces constant unlevered cash flows (26.38 in the example) for the remaining useful life of the assets (5 years in the example). The Unlevered Cash Flows (UCF) reflect exactly the return on and the return of the assets at replacement cost, thus their present value is 100;

b) Indefinite life perspective. In this case the firm must incur maintenance capex. Thus, the available cash flow declines as the Unlevered Free Cash Flows (UFCF) reflect only a return of the assets at replacement cost, equal to 10. As these capex ensure the firm's functioning over time, the enterprise value reflects the present value of a constant perpetuity equal to the return on assets (= 10).

The second section of the table shows the case of the zombie firm, which has an enterprise value lower than the Invested capital at replacement cost, as the annual Unlevered Cash Flows are lower than in the previous case (20 instead of 26.38) while the assets' replacement cost is also 100 (and their remaining useful life is also 5 years). The liquidation value is assumed to be equal to 25% of replacement cost (25 = 25% x 100), due to the high asset specificity.

There are five situations considered for zombie firms:

a) Perspective of definite life corresponding to the assets' remaining useful life. The UCF for the assets' five-year remaining useful life allow the recovery of an amount (enterprise value) equal to 75, which is lower than replacement cost, as UCF are lower than the sum of the return on and the return of assets at replacement cost;

b) Indefinite life perspective. In this case, the enterprise value falls to about half (36 vs. 75) of the amount recoverable by maintaining the firm alive until the end of the assets' remaining useful life, as maintenance capex have a negative net present value. Nevertheless, enterprise value is greater than forced-sale value (25);

c) Indefinite life perspective, under the assumption that after the first five years the firm is no longer in distress, without any restructuring. This would be the case of the firm that became distressed due to temporary adverse economic conditions. In this case enterprise value is equal to the amount recoverable through the definite life perspective (75), as the distress is only temporary and lasts until the end of the assets' remaining useful life.

d) Indefinite life perspective, under the assumption that the turnaround requires restructuring investments for five years and that such investments have a zero net present value, as the present value of the benefits of the restructuring from the fifth year on is exactly equal to the present value of the investments necessary to generate such benefits. In this case, the enterprise value is 36, that is the case of the firm that continues to operate without restructuring;

e) Indefinite life perspective, under the assumption that the restructuring investments generate benefits with a positive net present value equal at least to the difference between enterprise value in the definite life perspective (75) and enterprise value in the indefinite life perspective without restructuring (36).

All the situations considered entail an enterprise value lower than the invested capital at replacement cost, but greater than liquidation value. Firms in this situa-

tion destroy value but survive as they hold their lenders "hostage", under the threat of greater losses in case of forced sale. Zombie firms are structurally unable to recover both the assets' replacement value and the maintenance capex value, but since they are worth more alive than dead, they are kept in life. They may be firms that the competitive process cannot remove from the market (due to the support they receive from their lenders, which do not want to incur liquidation losses), or firms that play an important role in the supply chain of an industry and whose removal from the market could give rise to negative externalities.

Table 6. State of equilibrium and zombie firm

	Years	*0*	*1*	*2*	*3*	*4*	*5*	*TV*
case 1: state of equilibrium health firm (Enterprise value = value of the assets @replacement cost)								
	Finite life							
a	Value of the assets @ replacement cost	100						
b	wacc	10%						
c	Unlevered Cash Flows (UCF)		26,38	26,38	26,38	26,38	26,38	0
d	Discount factor		0,909	0,826	0,751	0,683	0,621	0
e=c*d	PV (UCF)		23,98	21,80	19,82	18,02	16,38	0
f	Enterprise value (finite life)	100						
	Indefinite life							
g	Manteinance capex		16,38	16,38	16,38	16,38	16,38	16,38
h = c-g	Unlevered Free Cash Flows (UFCF)		10,00	10,00	10,00	10,00	10,00	10,00
i	Present value UFCF		9,09	8,26	7,51	6,83	6,21	
l	Sum of PV(UFCF)	37,91						
m	Terminal Value							100
n	Present value TV	62,09						
o=l+n	Enterprise value (indefinite life)	100						
case 2: state of stress (zombie firm) (Enterprise value < value of the assets @replacement cost; forced sale value < replacement cost)								
	Finite life							
p	Unlevered Cash Flows		20	20	20	20	20	0
q	Present value Unlevered Cash Flows		18,18	16,53	15,03	13,66	12,42	0
r	Enterprise value (finite life)	75,82						
	Indefinite life w/out restructuring							
s = g	Maintenance capex		16,38	16,38	16,38	16,38	16,38	16,38
t=p-s	Unlevered Free cash Flows		3,62	3,62	3,62	3,62	3,62	3,62
u	Present value UFCF		3,29	2,99	2,72	2,47	2,25	
v	Sum of PV(UFCF)	13,72						
w	Terminal Value							36,20
y	Present value TV	22,48						
z =v+y	Enterprise value (indefinite life)	36,20						
	Indefinite life w/ restoring of normal earnings power							
aa=g	Maintenance capex		16,38	16,38	16,38	16,38	16,38	16,38
ab =p-aa	Unlevered Free cash Flows		3,62	3,62	3,62	3,62	3,62	10,00
ac	Present value UFCF		3,29	2,99	2,72	2,47	2,25	
ad	Sum of PV(UFCF)	13,72						
ae	Terminal Value							100,00
af	Present value TV	62,09						
ag =ad+af	Enterprise value (indefinite life)	75,82						
	Indefinite life w/restructuring (NPV of restructuring =0)							
ah = g	Maintenance capex		16,38	16,38	16,38	16,38	16,38	16,38
ai	Restructuring opex & capex (net of divestments)		12,00	11,00	10,50	9,50	8,43	0,00
al = p-ah -ai	Unlevered Free cash Flows		-8,38	-7,38	-6,88	-5,88	-4,81	10,00
am	Total cash flow undiscounted (= new finance)	-33,33						
an	Present value UFCF		-7,62	-6,10	-5,17	-4,02	-2,99	
ao	Sum of PV(UFCF)	-25,89						
ap	Terminal Value							100,00
aq	Present value TV	62,09						
ar = ao + aq	Enterprise value (indefinite life)	36,20						
	Indefinite life w/restructuring (NPV of restructuring >0)							
as = g	Maintenance capex		16,38	16,38	16,38	16,38	16,38	16,38
at	Restructuring opex & capex (net of divestments)		12,00	11,00	10,50	9,50	8,43	0,00
au = p-as -at	Unlevered Free cash Flows		-8,38	-7,38	-6,88	-5,88	-4,81	16,38
av	Present value UFCF		-7,62	-6,10	-5,17	-4,02	-2,99	
aw	Sum of PV(UFCF)	-25,89						
ay	Terminal Value							163,80
az	Present value TV	101,71						
az + aw	Enterprise value (indefinite life)	75,82						
	Forced sale							
aaa	Forced sale value (auction)	25						

Firms to be restructured

Unlike a zombie firm, a firm to be restructured can make restructuring investments capable of bringing its enterprise value above its assets' replacement value. The probability of success of the restructuring is negatively correlated to the gravity of the firm's imbalance and positively correlated to the reversibility of indirect distress costs. Restructuring, however, is a risky pursuit and may not turn out well. This is the reason why enterprise value must reflect, on one side, the restructuring perspective and, on the other, the possible liquidation. This is why enterprise value is never a good predictor of future value. Assuming for the sake of simplicity that equity value can be estimated to be equal to 100 under the successful restructuring scenario and to zero under the liquidation scenario and that the liquidation probability is 30%, equity value is equal to 70. However, 70 is a bad predictor of future value because, depending on which scenario comes to pass, equity value is either 100 or zero, but never 70. Thus, the enterprise value of firms in structural decline is an intrinsically unstable amount. With a wordplay, one might say that the enterprise value of a firm with a structural imbalance must also be unstable, as it can either turn into the value of the restructured firm or the value of the liquidated firm.

This instability carries with it an important consequence that is easy to bring to light by reference to the simple case where there are only two alternative scenarios (successful turnaround or liquidation). Typically, equity is positive when the restructuring is successful and zero in case of liquidation (as in case of liquidation not even debt can be recovered fully). Thus, whatever the probability assigned to either scenario (provided that the probability of the success scenario is different from zero):

- current equity value, calculated as the weighted average of the two amounts, is necessarily positive also when enterprise value is lower than he face value of debt (insolvent firm);
- current value of debt is at a discount to face value also when the current value of assets exceeds the face value of debt (firm in structural decline, though not insolvent).

Let's see why, through an example. The table below considers two alternative scenarios, involving restructuring or liquidation. For the sake of simplicity, both scenarios are assigned the same probability of occurrence (50%). The current value of the firm's assets is calculated as the weighted average of the expected values under the two scenarios. The face value of debt is 100.

Based on the definitions introduced previously the firm is technically insolvent when the (current) value of its assets is lower than the face value of debt. The table shows that this case does not assume that equity value is nil, but that the implied discount of the market value of the firm's debt to the debt's face value is greater than the current equity value [10].

The table shows the two cases of insolvency (EV < face value of debt) and non-insolvency (EV > face value of debt), highlighting that:

a) current equity value is positive in both cases;

b) current value of debt is at a discount to the debt's face value in both cases;

c) in case of insolvency, the discount to the nominal debt exceeds equity value, while in the non-insolvency case such discount is lower.

Table 7. Equity value and discount on debt: stressed and distressed firms

	Reorganization value	Probability of success	Liquidation value	Probability of liquidation	Current value (=weighted average)
Distressed firm (current value of equity < discount on face value of debt)					
EV	120	50%	60	50%	90
market value of debt	100	50%	60	50%	80
market value of equity	20	50%	0	50%	10
Face value of debt	100		100		100
Discount on face value of debt	0		40		20
Stressed firm (current value of equity > discount on face value of debt)					
EV	120	50%	90	50%	105
market value of debt	100	50%	90	50%	95
market value of equity	20	50%	0	50%	10
Face value of debt	100		100		100
Discount on face value of debt	0		10		5

[10] Gregory A. Horowitz, *Market Pricing in Solvency Valuation and Testing*, in R. j Stark, H.L. Siegel, E.S. Weisfelner, *Contested valuation in corporate bankruptcy*, LexisNexis, 2011.

5. Conclusions

The decline of a firm is rarely an unpredictable event. Except for the cases when the firm is "vaulted" into a state of distress due to unpredictable events (acts of God), in the other cases the decline originates from an obsolete business model or from the inability of the firm to adapt to changes in demand, technology or by long and adverse economic conditions which result in excess production capacity industry-wide. A decline normally gives life to indirect distress costs, such as loss of key employees, customers, suppliers, among others.

If decline is (to a large extent) predictable and most firms end up going through all its phases, it means that the monitoring and bonding systems that should signal promptly the decline conditions and prevent further deterioration are mostly ineffective or otherwise cannot trigger a timely and effective reaction by firms.

In the literature it is a well-known fact that monitoring and bonding systems

a) can never be totally effective, in the sense of ensuring that a breach of the maximum risk level set ex ante never occurs (as they should be capable of predicting all the risky situations in which the firm may find itself);

b) are costly and, as such, are analysed in view of the expected benefits (for example a continuous monitoring system of all management actions might in theory be the most effective control solution, but would entail a duplication of the management structure, with unbearable costs);

c) are not always incurred solely by the firm's shareholders; in particular, in the presence of free riding, they may be incurred also by creditors;

d) unless they are balanced, can exacerbate instead of solving conflicts of interest among; shareholders and creditors; different categories of shareholders; different categories of creditors (for example performance-based compensation for management – without any risk mitigants – may encourage management to undertake risky investments to the detriment of the firm's creditors);

e) are more effective in preventing firms from taking actions that might give rise to risks without returns, rather than encouraging them to react to difficulties in the interest of all the stakeholders.

The question that needs to be addressed before designing any monitoring or bonding system concerns the identification of the information necessary to diagnose correctly the state of decline and possible solutions.

The article has shown why, to be effective, monitoring a declining firm needs to be based on valuation measures.

The information necessary to estimate the value of a firm is of a strategic or management-based nature. Such information may be prospective (plans and budgets), current and historical (key performance indicators) of a private nature, which firms do not always have internally or, if they do have it, do not want to communicate externally to protect themselves from the competition. To make monitoring and bonding systems effective, it is thus necessary to operate on two fronts:

f) within the firm, with boards of directors and control bodies so that the company might implement a strong reporting system. Firms in decline typically show poor board governance processes, poor command of key financial and non-financial drivers, disordered priorities. Early diagnoses of distress requires an awareness that only informed and proactive governance allows the firm to identify problems on time and to solve them. Every firm has its own Achilles' heel, to be kept under control and monitored. Every board must be aware of what can "kill" the firm;

g) outside the firm, through independent parties (valuers) that can use private information and translate it into value estimates that can be used to determine whether the firm is operating profitably and building value or is instead destroying value prospectively. It is about using specialized advisors that would solve the problem of reporting strategic and management information to the outside world, in a credible form by putting their reputational capital on the line.

The mix of external value-based performance measures and the translation of those measures in reliable value estimates represents a good governance solution, as it can allow the early management of states of distress, through long-term remedial action.