SINGLE SUPERVISORY MECHANISM AND CORPORATE FINANCE: A DSCR BASED APPROACH FOR AQR PRUDENTIAL PROVISIONING

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Abstract

Asset quality review (AQR) conducted by the European Central Bank (ECB) introduced 2014 indicators and logic typically used in the context of corporate finance. The new approach tries to overcome the backward-looking approach in favour of a completely forward-looking perspective based on the assessment of cash flows. From the AQR point of view, EBITDA and DSCR have taken particular importance also in the prudential provisioning process. As is known, the AQR manual, for calculating the prudential provisioning, provides that banks, in a going-concern perspective, estimate the recoverable amount of loans by appropriately discounting the cash flows. Our work, although under some hypotheses, highlights limitations in the prudential regulatory approach. The paper, using a DSCR-based dual-leg approach, tries to propose a generalisation logically consistent with the guidelines on loan origination and monitoring recently expressed by the European Banking Authority (EBA) (EBA, 2020). Although there is literature dealing with access to credit constraints (Demirgüç-Kunt & Maksimovic, 1999; Beck & Demirgüç-Kunt, 2008; Calabrese, Girardone, & Slip, 2020), with the relationship between credit risk management framework and accounting standard (Porretta, Letizia, & Santoboni, 2020) and with loan loss coverage policies (Alessi, Bruno, Carletti, Neugebauer, & Wolfskiel, 2020), no empirical or theoretical research analyses the relationship between prudential provisioning and underlying incentive structure. This paper offers a contribution in this regard highlighting how an economic approach for provisioning tends to reward companies capable of generating adequate prospective cash flows given the contractual structure of the loan, thus mitigating the potential allocative distortions implicit in the incentive structure underlying the AQR approach.

Keywords: Provisioning, Debt Service Coverage Ratio, IFRS 9, Corporate Finance, Forward-Looking, Stochastic Model

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1. INTRODUCTION

The results of the first comprehensive assessment (supervisory risk assessment, asset quality review (AQR), and stress test) were published on 26 October 2014. Within the AQR framework (ECB, 2018) the introduction of corporate finance indicators is important.

In more general terms, the new European Single Supervisory Mechanism (SSM) rules are juxtaposed with the introduction of the International Financial Reporting Standard No. 9 (IFRS 9). These new guidelines share the assumption of a forward-looking perspective based on the assessment of expected cash flows and, therefore, on the overcome of a backward-looking approach.

From an AQR perspective, EBITDA and the correlated debt service coverage ratio (DSCR) indicator have assumed particular prominence. Together, they represent important parameters with regards to the dynamic financial sustainability of debt (Beltrame, Grassetti, Polato, & Velliscig, 2020).

For the calculation of the prudential loss provisioning, the AQR manual provides that in the event of the debtor being able to generate cash flows continuously (i.e., going-concern hypothesis), banks have to estimate the recoverable value by appropriately discounting these cash flows.

The modified approach towards banking supervision ratified in the first comprehensive assessment of 2014, the new classification of non-performing exposures (EBA, 2014), and the guidelines for the related management published by the European Central Bank (ECB)[1] are juxtaposed with the reform of international accounting standards relating to the impairment of financial instruments (IFRS 9).

Leaving aside the emergency measures made necessary by the recent pandemic crises[2], in an environment characterised by a significant deterioration in the quality of the banks' loans, the European Banking Authority (EBA) has intervened with regard to non-performing and forborne exposures by means of its own implementing technical standard (ITS).

Specifically, the EBA has redefined the boundary of non-performing financial assets (bad loans, unlikely-to-pay, and past-due exposures) and has introduced the category of forborne exposures.

Furthermore, within this setting, the EBA, through its guidelines to banks on non-performing loans, has provided a list (although this is not exhaustive) of factors that may be used to identify the state of financial difficulty[3].

The unlikely-to-pay and forborne status (even if performing) then clarifies how, from the perspective of the classification of loans, the explicit symptom of anomaly (such as non-payment) does not take on prominence in cases in which there are factors that imply a mere risk of default, such as a crisis in the industry or sector in which the debtor operates.

Moreover, the introduction of the IFRS 9 requires banks to operate provisions on loans following the principle of the expected loss (and not the principle of the incurred loss anymore) in a forward-looking perspective and, in certain cases, a long lifetime when they come under Stage 2, underperforming positions — subject to a significant increase in credit risk (SICR), and Stage 3, non-performing — credit-impaired — positions.

The definition of impaired credit and the monitoring of the SICR assumed, as known, by the passage to Stage 2, therefore, becomes fundamental. Furthermore, the relationships between the new accounting standard and the AQR and, more generally, the impacts of the forward-looking assessments on the risk estimate regarding credit portfolios also appear to be significant.

In its recently revised version following the introduction of IFRS 9, the AQR manual, after having defined the notions of impaired credit and credit subject to SICR (ECB, 2018, p. 110), identifies a list of minimum triggers for IFRS 9 staging classification (although this list is not exhaustive, without prejudice to the principle of the prevalence of business criteria should these be more conservative). The AQR manual also specifies that for AQR purposes what is classified as a non-performing loan is to be considered impaired.

The notion of financial difficulty, strictly tied to the cash flow capacity ("A financial asset is credit-impaired when one or more events that have a detrimental impact on the estimated future cash flows of that financial asset have occurred" (ECB, 2018, p. 110)), is central when pinpointing the impaired credit status ("Evidence that a financial asset is credit-impaired includes observable data about the following events: 1. Significant financial difficulty of the issuer or the borrower […]"(ECB, 2018, p. 110)).

In the AQR (ECB, 2018, p. 112), in particular, significant decreases in expected cash flows and DSCR < 1.1 (along with other factors) show evidence (minimum triggers) of significant financial difficulty for the purposes of identifying impairment, as does the forborne non-performing status. High absolute levels of PD (or significant increases in the PD level), in addition to the past-due status over thirty days, the forborne classification, and being placed in the under-observation category, all determine triggers for SICR[4].

Moreover, EBA's "Guidelines on loan origination and monitoring" published in May 2020 (EBA, 2020) in order to improve banks' processes and to ensure robust and prudent standards for credit risk-taking, management and monitoring, dispose of (for what it is now relevant) that institutions should:

- assess the borrower's current and future ability to meet the obligations under the loan agreement (EBA, 2020, p. 38, para 118) and consider

[1] In March 2017 the ECB published its "Guidance to banks on non-performing loans" (ECB, 2017), which was followed, in March 2018, by the relevant addendum which has outlined the supervisory expectations regarding the prudential provisioning levels for non-performing exposures (calendar provisioning, so-called). On 14 March 2019, the European Parliament passed a legislative resolution on the proposal to modify Regulation (EU) No. 575/2013 by reference to the minimum loss coverage for non-performing exposures.

[2] In March 2020 the Basel Committee for Banking Supervision (BCBS), the EBA, the European Securities and Markets Authority (ESMA) and the ECB, in consideration of the state of emergency brought about by the COVID-19 pandemic, took major steps designed to allow a (temporary) greater flexibility to banks with regard to the assessment of credit ratings. For this topic, see Borio and Restoy (2020).

[3] Specifically: 1) exposure/credit line expired by more than 30 days in a three-month period prior to its amendment or refinancing; 2) increase in the probability of default (PD) of the internal rating class of the company over a three-month period prior to its amendment or refinancing; 3) inclusion of the exposure in the category under review during a three-month period prior to its amendment or refinancing.

[4] A similar approach can be found in the ECB's recent "Guidance to banks on non-performing loans" (ECB, 2017), for example, among the unlikely-to-pay (UTP) events which trigger the non-performing status.

that cash flow from the ordinary business activities of the borrower […] is the primary sources of repayment (EBA, 2020, p. 38, para 119);

- put emphasis on the borrower's realistic and sustainable future income and future cash flow, and not on available collateral (EBA, 2020, p. 38, para 120);
- assess the sustainability and feasibility of the future repayment capacity under potentially adverse conditions […] that may occur in the duration of the loan agreement (EBA, 2020, p. 40, para 131);
- assess the business model and strategy of the borrowers, including in relation to the purpose of the loan (EBA, 2020, p. 40, para 132) and assess the feasibility of the business plan and associated financial projections, in line with the specificities of the sector in which the borrower operates (EBA, 2020, p. 40, para 133).

It is clear that consistently with the AQR and EBA framework, cash flow and EBITDA analysis have taken centrality from at least the following viewpoint: 1) the assessment of the borrowers' financial position; 2) the segmentation of credit exposures; 3) the individuation of significant debt or financial difficulties; 4) the definition of the prudential provision in a going-concern perspective.

The aim of this paper is to analyse the prudential provisioning model (AQR approach) in comparison with a different model (economic approach). More precisely, the paper, using a DSCR-based dual-leg approach, tries to propose a generalisation logically consistent with "Guidelines on loan origination and monitoring" recently published by the EBA (EBA, 2020).

Although there is literature dealing with problems in access to credit (Demirgüç-Kunt & Maksimovic, 1999; Beck & Demirgüç-Kunt, 2008; Calabrese, Girardone, & Slip, 2020), with the relationship between credit risk management, Basle III, and IFRS framework (Porretta, Letizia, & Santoboni, 2020), with loan loss coverage policies (Alessi, Bruno, Carletti, Neugebauer, & Wolfskiel, 2020) and with DSCR (Beltrame, Grassetti, Polato, & Velliscig, 2020), no empirical and theoretical research seems to analyse in-depth the relationship between prudential provisioning and access to credit incentive.

This paper offers a contribution in this regard highlighting how an economic approach to provisioning tends to reward companies capable of generating adequate prospective cash flows given the contractual structure of the loan, thus mitigating the potential allocative distortions implicit in the incentive structure underlying the AQR approach. This topic has significant implications on the mechanisms governing credit risk-taking (from the *ex-ante* valuation to the *ex-post* monitoring). It becomes even more relevant in a word hit by a significant exogenous shock.

The paper is structured as follows. Section 2 reviews the relevant literature dealing with credit access constraints. Section 3 analyses the methodology used. Section 4 presents and discusses results and empirical simulations. Section 5 concludes.

2. LITERATURE REVIEW

One of the most important profiles analysed in the literature pertains to credit access constraints (Demirgüç-Kunt & Maksimovic, 1999; Beck & Demirgüç-Kunt, 2008; Fazzari, Hubbard, & Petersen, 1988; Egger, Kunert, & Seidel, 2018; Calabrese et al., 2020) and, more generally, to the complex incentive mechanisms underlying the financial contracts (Aghion & Bolton, 1992) and to the debt covenants (Bazzana, 2008).

The conditions (and constraints) of access to credit reflect a plurality of factors: profiles connected to the so-called lending infrastructures, specific borrower risk profiles, nature of the bank-firm interaction, structural characteristics of the credit market (concentration and competition), and financial regulation.

Bank lending is also affected by cyclical factors and, more precisely, shows pro-cyclical dynamics (De Bondt, Maddaloni, Peydró, & Scopel, 2010) which, of course, have significant effects on the quality of banks' assets, on capital, and, consequently, on the granting of credit.

Analysing the results of the ECB stress tests conducted in 2014, Jabbour and Sridharan (2020) show a connection between provisions attributable to AQR and capital deficits under stress. Furthermore, banks with "concentrated" portfolios are riskier than diversified banks and have significant impacts on capital levels even under normal conditions as well as in stressful scenarios.

The literature has analysed the methods of bank-company relationship distinguishing transactional (transaction banking) and relational (relationship banking) approaches that allow a different degree of verifiability of the information underlying the credit relationship. It is also interesting to note how the transaction-relationship banking dualism is closely linked to the characteristics of the company in terms of information transparency.

The quality of the accounting information also derives from the accounting criteria (fair value accounting vs accounting conservatism) which condition (Kothari, Ramanna, & Skinner, 2009; Peek, Cuijpers, & Buijink, 2010) the timeliness with which the economically accrued losses are recognized. The assessment of creditworthiness also depends on the possibility of estimating future cash flows and profits (Bozzolan, Trombetta, & Beretta, 2009). This highlights the role of disclosure in a forward-looking perspective and, therefore, the growing importance of a relational approach.

The role of information in credit relations seems to prefigure a virtuous matching, on the one hand, between banks operating according to a relational model and opaque companies and, on the other, between transparent companies and transactional banks. An association between transactional banks and opaque firms would result in a potential credit crunch (Ferri & Murro, 2015).

The bank-customer interaction is also affected by the evolutions in the structure of the banking markets. The concentration of the credit market and a degree of competitiveness affect the processes of acquiring and processing information and its use for the purposes of credit line decisions, although with results that are not always uniquely identifiable.

The transformations taking place in the credit market have complex implications. The concentration of the banking system can have not only negative effects on the granting of credit if the emphasis is placed on strengthening market power or loosening

of relational ties (Berger & Udell, 2002), but also positive effects when the emphasis is placed on the processes of acquiring relevant information (Petersen & Rajan, 1995).

Likewise, the interactions between the size profiles of banks and the competitive environment are not easily framed in terms of the effects on the availability of credit. It is reasonable to expect small banks to be more responsive to competitive dynamics (Rajan, 1992). This greater flexibility, however, can result in a better ability to evaluate the company (and, therefore, in better conditions of access to credit) but also increase the incentives to extract income from the relationship. Considering the typical privileges of decentralised organisations in accessing soft information, small banks would seem to enjoy an advantage over larger banks, especially as regards the financing of small and medium-sized enterprises (SMEs) (Petersen & Rajan, 1994; Stein, 2002).

It should also be noted that the spread of Information Technologies in the credit supply processes contributes to redefining the border of the industry. One of the most important manifestations of the phenomenon is the spread of peer-to-peer lending platforms. The phenomenon is likely to produce significant (and potentially favourable) impacts on the granting of credit. The new IT frontier will likely affect the strategic choice of banks regarding the lending model (Currie & Lagoarde-Segot, 2017); in this context, the topic of redefining the balance between the transactional and relational model appears interesting.

For the purposes of this work, the impact of AQR prudential provisioning regulation on risk-taking in lending infrastructures assumes particular importance.

3. RESEARCH METHODOLOGY

Our research strategy is to present and clarify the AQR prudential provisioning model in order to propose a theoretical different economic DSCR-based model in close connection with the approach used in the IFRS 9 framework. We will show that, under some simplifying hypotheses, the AQR approach represents a particular case compared with the more general formulation. First, we have to start with EBITDA and DSCR definitions.

The EBITDA and the DSCR indicator have assumed particular importance within the AQR. As known, the EBITDA[5] constitutes a potential liquidity flow and serves as an important element in contributing towards a definition of DSCR.

Under the AQR, the DSCR is simply defined (although in an implicit way) in terms of the ratio of EBITDA to debt servicing (*interest expenses + debt repayment*). A basic formulation of the DSCR indicator can thus be expressed as follows[6]:

$$DSCR = \frac{EBITDA}{IE_{ST} + (IE_{MLT} + DR_{MLT})} \qquad (1)$$

where, IE_{ST} = interest expense on short-term debt; IE_{MLT} = interest expense on medium long-term debt; DR_{MLT} = debt repayment (medium and long-term debt).

In order to calculate the loss provisions, the AQR manual provides that in a situation where the debtor is still able to generate cash flows (going-concern approach), the banks will estimate the recoverable value by appropriately discounting these cash flows[7].

Considering the steady-state cash flow approach[8], the present value of the debtor's cash flows (the recoverable value) is determined by multiplying the (so-called) adjusted EBITDA by a fixed multiple (*M*). If the carrying amount (gross book value) of a given exposure exceeds the recoverable value, the bank must proceed with a supplementary provision.

More explicitly, by deducting the recoverable value from the book value of the credit exposure (for simplicity, at the initial moment, equal to the net financial position (NFP)), the impairment value is obtained (for simplicity, the value of total provision for loan loss (TP)).

Considering the steady-state cash flow approach, the present value of the debtor's cash flows (the recoverable value) is calculated by multiplying the adjusted EBITDA by a predetermined multiple. To put it more precisely, the AQR procedure involves: 1) estimating the *one-period sustainable cash flow* — CF_S; 2) converting this flow to its *present value* ($PV = M * CF_S$) by means of an appropriate *multiple* (*M*); 3) adding any discounted recoveries arising from the enforcement of guarantees which are independent of the operating cash flows; 4) assigning the present value to the bank (taking account of the other creditors' positions according to their relative seniority).

In particular, the CF_S equals the sum of the EBITDA and specific adjustments (*CF Adj* and *SA*):

- *Cash flow adjustment* (*CF Adj*) provides for the deduction from the EBITDA: 1) of taxes on income (profit before income taxes multiplied by the "tax rate on the actual income"); 2) of the essential dividends needed to guarantee a reasonable remuneration for shareholders; c) of capital expenditures.
- *Sustainability adjustments* (*SA*) are applied in cases where the cash flows are judged to be unsustainable because of particular accounting policies implemented.

Cash flow value (recoverable value) for the bank *i* at the time *t* = 0 is equal to[9]:

[5] In the AQR, the EBITDA is defined as: *revenues - cost of sales - distribution costs - administrative expenses excl. depreciation/amortisation - payroll taxes + other gains/losses* (ECB, 2018).

[6] In more general terms, ignoring the initial cash stock and assuming that there are no arrears and/or instalment operative debts, the DSCR numerator should be fuelled by an operating cash flow. This aggregate certainly seems more significant than the EBITDA.

[7] From a going-concern perspective, the future operating cash flows still exist and can be used for repayment of the debt; the guarantee can be claimed as long as it does not affect the operating cash flows. From a gone-concern perspective, on the other hand, the guarantee is claimed and the debtor's operating cash flows are stopped (the future operating cash flows are expected to be low or negative, the exposure is significantly guaranteed, and the guarantee is essential for the generation of cash flows; the business continuity (going concern) can have a negative effect on the recoverable value through a further and significant increase of the financial exposure or a reduction of the value of the guarantee).

[8] The lack of growth for the company means that the working capital remains constant. For this reason, the cash flow from operations matches the EBITDA or the operating income after tax (*EBIT(1 - t)*) if investments are equal to amortisation and depreciation.

[9] Any income derived from the sale of guarantees can be added to the *cash flow value* as long as it is not fundamental for the debtor's operating cash flows management.

$$CFV_{0,i} = MIN\left[\frac{MAX\ (AA - PC_i; 0}{E_i + EPP_i}; 1\right]E_i \qquad (2)$$

where, *amount for allocation* (*AA*) = present value of operating cash flows $PV = M * CF_S$ + any cash and cash equivalents; *preferred claims* (*PC*) = third-party credits with higher seniority; *exposure* (E_i) = value of the *i-th* exposure; *exposure pari passu* (EPP_i) = third-party credits having the same seniority as the *i-th* bank.

Assuming some simplifying hypotheses[10], it is straightforward to verify that:

$$TP = NFP - M \times CF_S \qquad (3)$$

Given that the reciprocal of the multiple *M* can, from an economic point of view, be interpreted as a proxy of the weighted average cost of capital ($M = 1/k_A$)[11], it can be seen that:

- the recoverable value (*cash flow value*) represents a proxy of the *enterprise value* (*EV*) of the borrower;
- the valuation reserves (*total provision* for loan loss) of the bank represent a proxy of the (negative) *equity value* (*EqV*) of the indebted company.

In the AQR approach, the *total provision* (*TP*) therefore corresponds, in principle, to the value (which is negative by hypothesis) of the debtor's economic capital. Given:

$$EV = \frac{EBIT(1-t)}{k_A} \qquad (4)^{12}$$

it results in $TP = NFP - EV$, from which, setting: $cr_{AQR} = \frac{TP}{NFP}$:

$$cr_{AQR} = 1 - \frac{1}{\frac{NFP}{EBIT(1-t)}k_A} \qquad (5)$$

In other terms, if the economic capital of the debtor assumes a negative value, the reestablishment of the equilibrium takes place by order, from the beginning, an appropriate provision to be borne by the bank shareholder. The *coverage ratio* of the going-concern credits is, therefore, a function of the multiple *NFP/adj EBITDA* and the opportunity cost of the invested capital (k_A).

Once the *NFP/EBITDA* multiple is known, the impact on coverage differs, from a theoretical point of view, according to the characteristics of operational risk. In the AQR, however, since the multiple of the adjusted EBITDA is predetermined ($M = 1/k_A = 6$), the maximum limit (equal to 6) of the given ratio identifies the value beyond which the credit value adjustment becomes necessary (if, indeed, *NFP/EBITDA* = 6, *cr* = 0).

In the abstract, the parameter k_A allows, in the quantification of coverage, a Business Risk Index to be considered. In synthesis, whenever a bank finances companies having a high operational risk (a high degree of operating leverage (DOL), a high Business Risk Index and, consequently, a high k_A), then it should favour counterparties characterised by a low NFP/EBIT multiple to pursue an objective in terms of a moderate coverage ratio.

The quantification model of prudential loan loss provisions which underpin the AQR exercise is based to a large extent on the notion of insolvency (default) formalised in the structural approaches to credit risk whose origins can be traced to the pioneering contribution made by Merton (1974)[13]. On the basis of the assumptions made, the PD consequently identifies the probability that, in the period of time under consideration, *asset value < debt value (EV < D)*.

The approach in question presupposes that the intermediary can decide, at any time, whether to maintain the risk of the given position or to liquidate the company at its net value (*EV - NFP*).

It is also clear from the previous formulation that, for the same NFP/EBIT ratio, the time distribution of debt (synthetically represented by the parameter λ), and thus its relative sustainability, does not play any part in determining the coverage[14].

Nevertheless, it is evident that there is a contradiction between the declared going-concern evaluation and the logical assumption for the AQR value adjustment, which is subordinated, by construction, to the existence of a situation of technical insolvency. In other words, if there is an adjustment, there is certainly (technical) insolvency; there can be no adjustment without insolvency (and, thus, in the going-concern hypothesis).

Further, the AQR approach is not immediately reconcilable with quantifying principles of the fair value of financial instruments within the IFRS 13 framework.

For quantifying the correct loan loss provisions for the bank, it may be useful to consider, in first approximation, a credit of unitary amount, repayable at a time *n*, and on which interest accrues at an agreed rate k_d.

The *economic value of credit* (*CEV*) can be calculated by discounting the *expected cash flows* ($E(C_i)$) at the *expected rate* (*y*) (Borio & Lowe, 2001). It will, therefore, be in a generic *t-th* moment:

$$CEV_t = \sum_i^n \frac{E(C_i)}{(1+y)^{i-t}} \qquad (6)$$

Or, equivalently, by indicating the expected loss rate with $E(l_i)$ (Borio & Lowe, 2001):

[10] $AA = CFV_{0,1} = EBITDA * M;\ EPP_i = 0$.

[11] The ECB reports that the multiples indicated in the AQR for the purpose of calculating the present value are in conformity with the standard market procedures and indicate the level of leverage in the operating cash flows which may be achieved over a mid-term time horizon holding a DSCR greater than 1 (ECB, 2018, p. 132). For companies which differ from those operating in the infrastructure (*M* = 12) and utilities (*M* = 10) industry, a value of *M* = 6 has been used.

[12] In equation (4) the adjusted EBITDA coincides with the operating income after taxes (*EBIT(1 - t)*) if investments are equal to amortisation and depreciation.

[13] As is known, Merton's model is based on two key hypotheses: 1) the *enterprise value* of the debtor evolves by following a geometric Brownian motion (GBM); 2) the company issues a zero-coupon bond with maturity *T*. Given the assumptions made, *equity* can be interpreted as a call option on the assets (with strike price equal to the value of the debt), whose value (premium) is a direct function of time and volatility of the underlying. The put-call parity implies that the debt value of the company can be expressed as the value of the risk-free zero-coupon bond minus the value of a put option with strike equal to *D* and maturity *T*. Given the balance sheet model at market values (*EV = D + E*), the default condition will occur if asset value < debt value (*A = EV < D*).

[14] Since the AQR loan loss provisions are subordinated, by construction, to the presence of a negative value of economic capital and, therefore, to a situation of technical insolvency, from a logical economic point of view the AQR coverage identifies the loss given default (LGD) (being the PD equal to 1); in such a context, the coverage ratio in the final analysis represents a proxy, given the default, of the cumulative loss relative to the period of time under consideration (*t = n*).

$$CFV_t = 1 + \left(\sum_i^n \frac{E(k_d - y_i)}{(1+y)^{i-t}} - \sum_i^n \frac{E(l_i)}{(1+y)^{i-t}} \right) \quad (7)$$

Equation (7) highlights that the *economic value of a credit*, in a generic *t-th* moment, is equal to the algebraic sum of the following elements[15]:

- the *nominal value* of the exposure;
- the sum of the *present value* (at the *expected rate*) of the difference between the *agreed rate* and the *expected rate* (the so-called interest margin) over the entire residual maturity of the loan;
- the sum of the present value (at the *expected rate*) of the *expected losses* over the entire residual maturity of the loan.

Since the probability of default is normally non-zero, the expected rate is generally lower than the contractual rate. The difference between the contractual rate and the expected rate indicates the expected loss which is "embedded" in the price conditions. Moreover, the ratio between the *agreed rate* k_d and the *expected rate* y is governed, in equilibrium conditions, by a strict logical relationship. Assuming a context of risk neutrality, in respect of credit with a unitary maturity, it is simple to verify that:

$$k_d = \frac{\left(y + E(l)\right)}{\left(1 - E(l)\right)} \quad (8)$$

Nominal value and *economic value* differ in the assumption of a discrepancy between the *present value* of the *expected losses* and the present value of the interest margin, and, therefore, if:

- the credit has been granted on non-equilibrium conditions: the present value of the expected losses is greater than the present value of the interest margin[16];
- the borrower's creditworthiness changes after the credit is taken out (therefore modifying the present value of the alleged losses) without the price conditions being modified (or being adequately modified) at the same time;
- the interest margin changes with an unchanged debtor's risk profile (expected losses)[17].

In this regard, being *TP* equal to the difference between the book value of the credit and its *economic value*, the coverage will be equal to the difference between the *present value* of the *expected losses* and the *present value* of the *losses* which are embedded in the interest rate (interest margin).

In formal terms, assuming that the interest margin remains fixed over time,

$$cr_t = \sum_i^n \frac{E(l_i)}{(1+y)^{i-t}} - \sum_i^n \frac{k_d - y}{(1+y)^{i-t}} \quad (9)$$

and, at the initial moment:

$$cr_0 = \sum_i^n \frac{E(l_i)}{(1+y)^{i}} - \sum_i^n \frac{k_d - y}{(1+y)^{i}} \quad (10)$$

As to focus attention on the financial sustainability of debt, it, therefore, seems possible to present a different (and more general) approach to the quantification of the coverage of the going-concern credits, in respect of which the AQR becomes a particular and borderline case.

This approach is based on the relationship between debt servicing (or, for simplicity, payment of the instalment) and the amount of free cash flow. In this regard and a strictly functional manner with the aims of this work, we assume that:

- the credit is repayable according to a repayment plan with fixed periodic instalments (which are divided into capital and interest quotas);
- the expected loss is quantifiable by the difference between the instalment and the available cash flow (the latter assumed to be equal to *EBIT(1 - t)*)[18].

The logical simplification underpinning this approach appears evident: the *expected loss* is approximated, *ceteris paribus*, by the periodic flow insufficiency compared to debt servicing (therefore excluding, among other things, the effects on the entire residual debt and the existence of previously accumulated cash flows).

Nevertheless, these obvious limitations need to be seen in the framework in which the prudential provisioning AQR is placed, which favours (albeit in different ways) the cash flow and debt analysis. They allow for the periodic expected losses to be expressed as a function of the DSCR, overcoming the hypothesis of an instantaneous liquidation of the company (which is, in a general way, unrealistic). This hypothesis sets up an evident logical fiction, which enables the value of the economic capital (if negative) to be used as a proxy of the adjustment.

The *TP* amount can therefore be expressed as follows:

[15] This equation also identifies the relationship between economic value and book value of credit.

[16] This hypothesis may occur, for example, in a situation where the bank is willing to grant some loans at non-equilibrium rates (in order to defend its market shares or to enhance customer relationships) or where it succeeds in obtaining more favourable conditions than the equilibrium ones (asserting a strong bargaining position).

[17] Such a situation can occur when the discount rate (expected rate) changes over time, for example, in line with the evolution of market rates, without the agreed rate changing.

[18] At the time $t = 0$ with regards to the generic *i-th* moment, the expected loss (in relation to the initial NFP) can be expressed in formal terms as follows: $el_{0,i} = \lambda(1 - DSCR_i)$ with $DSCR_i < 1$. From this, assuming that the instalment is constant and keeping in mind the meaning of λ, we have: $el_{0,i} = \frac{R(1-EBIT_i(1-t))}{FNP}$. Therefore, the expected loss (in relation to the initial NFP) is merely a function of the periodic DSCR that is the dynamics of EBIT.

$$TP_t = \sum_{i=t+1}^{n} \frac{R_i - EBIT_i(1-t)}{(1+y)^{i-t}} - \sum_{i=t+1}^{n} \frac{(k_d - y)}{(1+y)^{i-t}} DR_i \tag{11}$$

By solving for the DSCR after some simple algebraic steps, we obtain:

$$cr_t = \sum_{i=t+1}^{n} \frac{(1 - DSCR_i)\frac{R}{RD_t}}{(1+y)^{i-t}} - \sum_{i=t+1}^{n} \frac{(k_d - y)}{(1+y)^{i-t}} \times \frac{1 - v^{n-i}}{1 - v^{n-i}} \tag{12}$$

$$cr_0 = \lambda \sum_{i=1}^{n} \frac{(1 - DSCR_i)}{(1+y)^{i}} - \frac{(k_d - y)}{1 - v^n} \sum_{i=1}^{n} \frac{1 - v^{n-i}}{(1+y)^{i}} \tag{13}$$

Assuming, for simplicity, that both the DSCR and the interest margin are constant, the above formulation becomes:

$$cr_0 = \lambda(1 - DSCR) \sum_{i=1}^{n} \frac{1}{(1+y)^{i}} - \frac{(k_d - y)}{1 - v^n} \sum_{i=1}^{n} \frac{1 - v^{n-i}}{(1+y)^{i}} \tag{14}$$

Or, more simply[19]:

$$cr_0 = \lambda(1 - DSCR)A - (k_d - y)B \tag{15}$$

where,

$A = \sum_{i=1}^{n} \frac{1}{(1+y)^{i}}$;

$B = \frac{1}{1 - v^n} \sum_{i=1}^{n} \frac{1 - v^{n-i}}{(1+y)^{i}}$

4. RESULTS, EMPIRICAL SIMULATIONS, AND DISCUSSION

In its general formulation (see equation (15)) the coverage ratio is inversely proportional to the DSCR. Furthermore, the coverage depends on the interest margin and therefore on the expected loss embedded in the contractual rate and on the marginality of the bank.

The higher the DSCR is, the smaller the provisions will be. The size of the interest margin has a positive impact on the provisions: at the same contractual rate, the lower the weighted average cost of capital (WACC) of the bank, the more contained the prudential value adjustments will be.

It is also clear that *ceteris paribus*, the duration of the repayment plan is a discriminating factor. In particular, NFP and EBITDA being equal, debt sustainability depends on the adequacy of the time distribution of debt servicing.

Although undeniably simplified our model presents elements of fair evaluation techniques based on a dual-leg approach[20]. It, therefore, differs from the IFRS 9 impairment model, which provides for the recognition of the expected losses based on the level of deterioration of assets[21].

Although presenting some elements of the correct framework of credit risk management[22], the calculation of the amortised cost under IFRS 9 appears nevertheless to violate its underlying logic (Porretta et al., 2020)[23].

The differences between the AQR model and the proposed coverage ratio model are immediately evident. The AQR coverage ratio, indeed, does not depend on:

- the time distribution of debt and the modes of determining the repayment plan;
- the absorbed capital and the cost of the capital of the financing bank and, therefore, the weighted average cost of the lender's liabilities;
- the expected losses embedded in the contractual interest rate applied by the specific bank.

The AQR coverage, thus, depends entirely on the value assumed by the multiple *EBITDA/NFP*. The maximum limit that this ratio may assume identifies the value beyond which the credit value adjustment becomes necessary (in short, in a situation where *PFN/EBITDA* > 6, *cr* > 0).

In brief, the *cr* AQR is exclusively constructed with reference to the debtor's parameters and does not take into account either the specific debt structure or the specific characteristics of the lending bank and the associated credit portfolio.

It is easy to verify how the AQR approach represents a particular case compared with the more general formulation corresponding to some simplifying hypotheses: interest margin equal to zero ($y = k_d$); infinite time horizon (perpetual debt); $M = 1/k_d$ ($k_d = k_A = y$). Given that:

[19] In order for there to be a value adjustment of credit ($cr > 0$), there must clearly be: $DSCR < 1 - \frac{(y - k_d)}{1 - v^n} \frac{B}{AA}$.

[20] In the dual-leg approach the expected loss of a credit corresponds to the expected value of the possible losses resulting from insolvency which can occur, with varying degrees of probability, at any time throughout the contract. For the creditor, with regards to his/her portfolio, the expected loss therefore defines the expected value of a statement of costs that should be offset in the parallel statement of revenues relating to credit premiums that the creditor expects to receive from the counterparties that, over time, will be in a state of solvency. On any valuation date, the value of a credit is the value of the default-free leg corrected by the value of the credit leg.

[21] According to this approach, financial instruments are grouped in three classes (stages) and transferred from one class to another according to the recognition (or non-recognition) of a significant increase of risk in comparison with that encountered at the date of first registration (Sicr). The classes are as follows. Stage 1: performing credits without any significantly increasing risk. Stage 2: performing loans which credit quality has undergone a significant deterioration since the date of first registration. Stage 3: impaired assets (past due non-performing, unlikely-to-pay, and bad loans).

[22] In the IAS 39 incurred losses model the trigger event is only a loss event. When moving to an expected losses model the object of the evaluation is no longer the loss underlying the loss event but the risk of loss against a contractual interest rate collected pro rata temporis. This model overcomes the limitations of the incurred losses model (the too little, too late problem), because it brings with it the obligation to make provisions without having to wait for a loss event (Calandrini, 2013).

[23] The expected loss is obtained as the difference between contractual flows and expected flows discounted at the internal return rate effective at the time of stipulation. To calculating the actual return, the principle applies a single-leg approach, which discounts the vector of the contractual flows, including credit premiums, through rates increased by the spread to such an extent as to obtain a credit value which is equal to its initial book value. On the other hand, in the modelling of correct credit pricing (at inception), the default-free rate covers the WACC as well as the operating costs.

$$lim_{n\to+\infty} cr_0(n) = lim_{n\to+\infty}\lambda\sum_{i=1}^{n}\frac{(1-DSCR_i)}{(1+y)^i} + \frac{(y-k_d)}{1-v^n}\sum_{i=1}^{n}\frac{1-v^{n-i}}{(1+y)^i}, \tag{16}$$

it results:

$$lim_{n\to+\infty}\lambda\sum_{i=1}^{n}\frac{(1-DSCR_i)}{(1+y)^i} = \lambda\left(\sum_{i=1}^{+\infty}\frac{1}{(1+y)^i} - \sum_{i=1}^{+\infty}\frac{DSCR_i}{(1+y)^i}\right) = \lambda\left(\frac{1}{y} - \sum_{i=1}^{+\infty}\frac{DSCR_i}{(1+y)^i}\right); \tag{17}$$

$$lim_{n\to+\infty}\frac{(y-k_d)}{1-v^n} = (y-k_d)\,; \tag{18}$$

$$lim_{n\to+\infty}\lambda\sum_{i=1}^{n}\frac{(1-v^{n-i})}{(1+y)^i} = \frac{(k_d-y)}{y(k_d-y)} = \frac{1}{y}; \tag{19}$$

Equation (19) is:

$$\sum_{i=1}^{n}\frac{1-v^{n-i}}{(1+y)^i} = \sum_{i=1}^{n}\frac{1-(1+k_d)^{i-n}}{(1+y)^i} = \frac{\left((k_d+1)(y+1)\right)^{-n}((y+1)^n((k_d+1)^n(k_d-y)+k_dy+y)-k_d(y+1)(k_d+1)^n)}{y(k-y)} = \frac{y(k_d+1)^{1-n}-k_d(y+1)^{1-n}+k_d-y}{y(k_d-y)}$$

Thus, in short:

$$lim_{n\to+\infty} cr_0(n)\frac{\lambda-(k_d-y)}{y} - \lambda\sum_{i=1}^{+\infty}\frac{DSCR_i}{(1+y)^i} \tag{20}$$

If the DSCR is constant and the interest margin equal to zero ($y = k_d$), observing that for $n \to \infty$, $DSCR = \frac{EBIT(1-t)}{IE}$ and $\lambda \to k_d$,
we obtain: $cr_0 = 1 - \frac{EBIT(1-t)}{k_d NFP}$. If, finally, $M = 1/k_d$,
it results: $cr_0 = 1 - \frac{EV}{NFP}$.

The AQR approach for quantifying prudential loan loss provisions have clearly important impacts on corporate financing and firm capital structure. Indeed, greater prudential provisions imply, *ceteris paribus*, less capital, and less credit to the real sector. Moreover, the relationship between provisions and debt sustainability is relevant in the light of the specific contractual characteristics (Demirgüç-Kunt & Maksimovic, 1996) and macroeconomic conditions (Korajczyk & Levy, 2003).

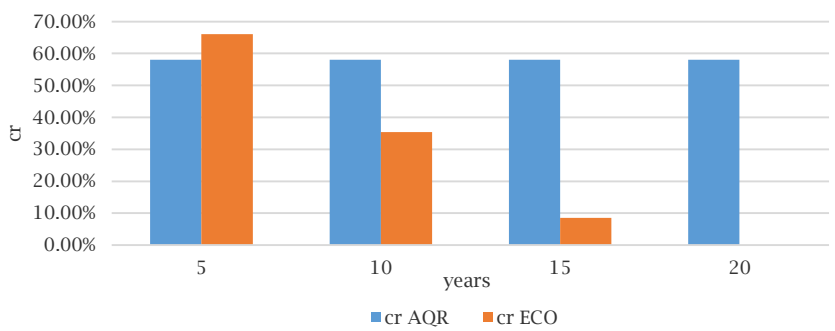
Some straightforward numerical simulations may clarify the proposed perspective and the impacts in terms of credit access.

Table 1 and Figure 1 define the hypotheses relative to the parameters. First of all, let us imagine considering a constant DSCR, starting from a specific EBIT value and determined loan maturities (with a repayment plan with fixed instalments).

Table 1. Static simulation parameters

Variable		*Variable*		*cr AQR*
EBIT(1 - t)	7	K_d	5.56%	58.00%
NFP	100	*y*	3.56%	
M	6	*mi*	2.00%	
Years	5	10	15	20
	23.46%	13.30%	10.00%	8.41%
DSCR	29.84%	52.61%	69.98%	83.24%
cr ECO	66.09%	35.42%	8.49%	0.00%
cr AQR	58.00%	58.00%	58.00%	58.00%

Figure 1. cr AQR and cr ECO



As it can be seen, given the fundamental parameters relating to the debtor (NFP and EBIT), with a constant AQR coverage, the coverage according to the proposed generalisation (*cr* ECO) appears to be decreasing as the maturity of the repayment plan increases and, thus, as the DSCR increases.

The presence of a positive interest margin allows the absence of value adjustments in a context (20 years) where the DSCR is less than 1 (83.24%).

The interest margin depends not only on the ability of the bank to transfer the expected losses to the contractual rate (the dynamics of the DSCR is relevant to the logic of the model) but also on the level of the weighted average cost (value of *y*). It seems intuitive to note that, at the same contractual rate, a reduction in the weighted average cost of the liabilities of the bank implies a reduction of the coverage. Policy interventions intended to reduce the absorbed capital not only imply, therefore, a higher level of leverage for the intermediary, but also a lower level of *TP* (at the same cost of equity).

Figures 2 and 3 show the relationship between coverage and DSCR and between coverage and interest margin for different maturities in the repayment plan of the loan.

Figure 2. DSCR and coverage

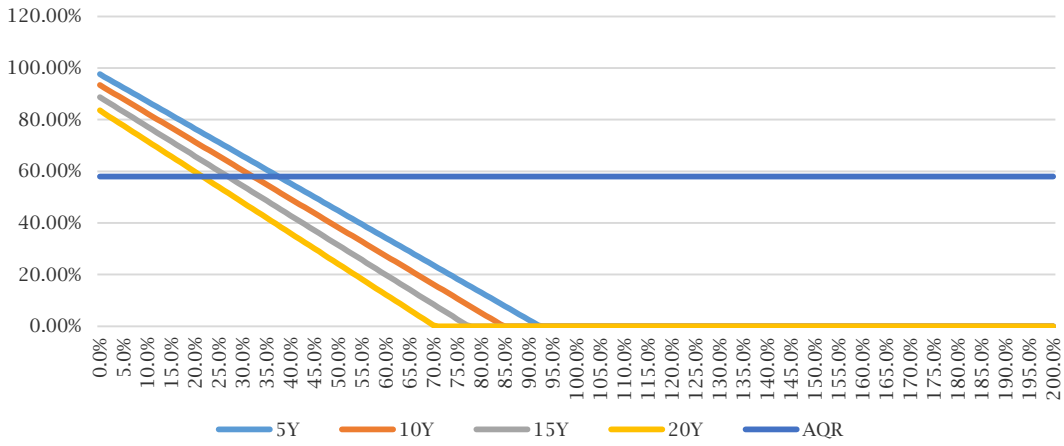
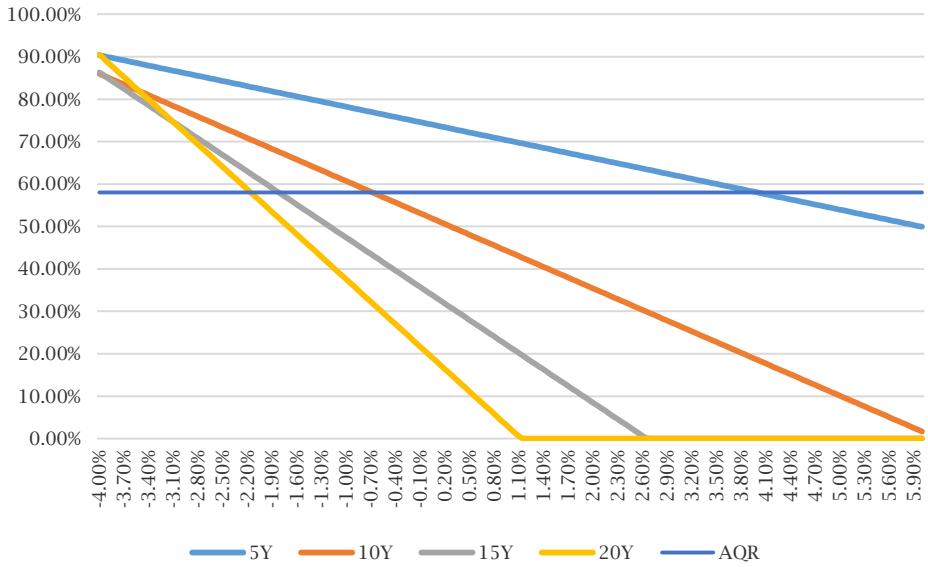


Figure 3. (kd-y) and loan term



As clearly seen, where the AQR coverage only depends on the NFP/EBITDA multiple, the economic coverage ratio is a decreasing function of the DSCR (linked to the time distribution of debt) and the interest margin (linked to the weighted average cost of the lender's liabilities and the expected losses embedded in the contractual interest rate being charged).

The presence of indifference points with regards to the AQR coverage is also evident. From an analysis of the graphs, it is possible to identify (the interest margin being equal) specific levels of DSCR (naturally decreasing as the loan duration increases) that generate coverage that is identical to the AQR coverage.

Speculatively, given the same level of DSCR, there are specific interest margin levels (which are also naturally decreasing as the duration of the funding increases) that generate an identical coverage to the AQR coverage.

The penalisation of the AQR approach potentially acts on the incentive structure and, consequently, on business policies. In principle, the provisioning policy should lead banks to prefer less risky companies in terms of predictability and cash flows volatility. To the extent that bank credit is relatively cheaper for riskier companies, there could be a clear incentive to overburden debt financing. Reinterpreted in a theoretical sense, such an incentive would reflect, albeit in a different context, the arguments relative to the pecking order theory.

An increase in the level of indebtedness brings, of course, certain significant implications which can be attributed to the phenomenon of agency costs of debt[24]. These costs oppose the interests of shareholders and creditors and may be reflected in:

- an incentive to become involved in high-risk projects, albeit with a negative net present value. In such circumstances, the incentive system could be reflected in an over-investment. This would result in an increase in the riskiness of companies, especially for those on the brink of a distressed condition. This is a well-known phenomenon of asset substitution.
- an incentive to under-invest at a time when the benefits of projects with a positive net present value for the company are "appropriated" by creditors. In such a case, the investment would translate into a value reduction for the shareholders.

For the least risky companies, it is likely to recognise potential effects on funding costs. With regards to companies with high DSCR levels and the capacity to generate stable free cash flows, distorting effects in investment policies are unlikely to represent a noticeable risk.

Nevertheless, it is possible to detect potential effects on funding choices. Indeed, the financial ability of the investment could easily be guaranteed by self-financing which, similar to the indications of the pecking order theory, would be preferable to a recourse to debt financing, the latter being costlier in the light of what has been considered above. However, potentially distorting effects could occur in so far as the company might identify a target financial structure that provides for greater levels of debt. In such a case the additional debt, which would be relatively costlier than an equilibrium condition, would imply an increase in the WACC.

5. CONCLUSION

Although under a strong hypothesis, our work highlights some limitations in the AQR prudential provisioning model. No previous empirical or theoretical research seems to have analysed in-depth the relationship between prudential provisioning framework and underlying incentive structure.

As it has been shown, the AQR coverage only depends on the NFP/EBITDA multiple without considering important elements such as:

- the time distribution of the debt servicing, and thus, as noted, the EBITDA does not take actual and prospective DSCR into account;
- the weighted average cost of the bank liabilities;
- the expected losses embedded in the contractual interest rate applied by the specific bank.

It is, therefore, clear that the AQR coverage takes no account of either the specific structure of debt or the specific characteristics of the lender and the related loan portfolio. The AQR approach, therefore, potentially acts on the incentive structure and, consequently, on business policies.

This paper offered a contribution in this regard highlighting how an "economic" approach to provisioning tends to reward companies capable of generating adequate prospective cash flows given the contractual structure of the loan, thus mitigating the potential allocative distortions implicit in the incentive structure underlying the AQR approach. This topic has significant implications on the mechanisms governing credit risk-taking (from the *ex-ante* valuation to the *ex-post* monitoring).

The considerations about a different loss provisions model reveal a renewed centrality regarding financial planning processes of flows generated by current operations, capital expenditures, and funding policies. There are, however, differing implications that depend on the risk profile of the company.

For the riskiest companies, a consistent financial planning process (in terms of size and timing of investments and cash flows) becomes a crucial element in the control of financial risks in the framework of a more general enterprise risk management system that enables strategic and operational risks to be monitored. In a context of unfavourable deviation of the business trajectory from plan expectations, an effective enterprise risk management system should prevent excessive and disorderly debt levels and enable timely adjustments of the financial structure. The timing of these adjustments becomes crucial in order to avoid an excessive burden of debt agency costs on business policies.

From the bank point of view, there is a problem of the credit assessment in conditions of high uncertainty; from the company point of view, there is a considerable problem regarding the incentive to invest which is not only linked to the availability of financial resources but also the existence of appropriate organisational and control structures.

To conclude we can say that in conditions of heightened macroeconomic uncertainty it becomes essential for banks to use (in line with the indications expressed by the EBA in 2020) broader data for its reliability analyses; in the same way, the adoption of forward-looking evaluation approach can no longer be delayed.

[24] Agency costs are increasing compared with the debt level and affect equity investors (*debt overhang*). From a shareholder's perspective, agency costs constitute indeed a deterrent to investment and to the increase in the levels of indebtedness (even in cases where there is an expected increase in the value of the company).

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