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Course of Financial Reporting and Performance Measurement

"Codice della crisi di impresa e dell'insolvenza": a retrospective analysis on the effectiveness of the alert indicators

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Table of Contents

1. Introduction

With the issuing of the legislative decree n. 14 on 12th January 2020, the new Italian Code of business default and crisis (Codice della crisi di impresa e dell'insolvenza) was introduced, with the intent to reform insolvency proceedings and regulate alerting and crisis settlement practices. The new regulation is aligned with supranational recommendations, which set the guidelines for a new approach to business failure and insolvency, with the objective "to ensure that viable enterprises in financial difficulties […] have access to national insolvency frameworks which enable them to restructure at an early stage with a view to preventing their insolvency, and therefore maximize the total value to creditors, employees, owners and the economy as a whole." (European Commission Recommendation, 12th March 2014)".

Indeed, the reform of 2019 is intended to bring out an "early diagnosis" of the state of insolvency of the enterprise before the situation becomes irreversible in terms of business continuity.
The main rational of the new framework is powered by the goals and objectives set by international and supranational standards, as I will explain during the dissertation, stating that the regulatory structure of the business crisis and failure should aim at safeguarding the residual value of the enterprises, rather than dispel such value for purposes of asset liquidation. This latter perspective must be overcome, because it is in practice outdated and tremendously ineffective in delivering the ultimate objective of bankruptcy and insolvency laws, that is to protect the whole financial and economic system.

For this purpose, the new legislation introduces a completely renewed regulatory framework, which can also be viewed as disruptive, in light of all the marked differences with respect to the old context.
The new regulation is primarily intended to introduce a preemptive phase of individuation of a state of alert, thus in favor of the emerging of distress symptoms, aimed to allow a prompt analysis of the causes of the economic and financial troubles of the enterprise. A second consequent objective is to encourage an assisted crisis

resolution process, functional to the negotiations for reaching an agreement with the creditors, or possibly with only some of them.

The outcome of these underling motivations and purposes is the introduction of an alerting system based on the activation of a set of "alerting indicators". Namely, they indicate imbalances in terms of profitability, capital structure and financial requirements, with respect to specific characteristics of the business. In a few words, the system has been created with the intention to act as a reliable symptom of a likely imminent state of crisis and insolvency of the enterprise.

It is important to highlight, here in this very first Chapter, the definition of a state of business crisis, as provided in the new Code of business crisis and insolvency. The concept of business crisis is defined as a situation of "economic and financial imbalance", which make the emerging of a future state of insolvency of the debtor enterprise. Moreover, the article 13 of the Reform, that will be presented in the Chapter 2.5 regarding the system of indicators, clarifies that the existence of a situation of economic and financial imbalance is represented by the unsustainability of debts for the following six months, and the absence of the perspective of business continuity. When the alerting indicators are "on", the existence of a state of alert is verified.

The new system of alerting Indicators represents the core focus of this work. After a brief presentation of the rationales and an overview of the regulatory framework, we will focus the attention on the effectiveness of such figures, in attempt to evaluate their effectiveness in predicting the coming of an irreversible financial crisis and the actual benefits provided from the new framework in the Italian economic system.

The motivation for this research work is mainly due to the relevance of the new regulation. The completely new layout and functioning introduced with the Reform represents a breakthrough innovation, in attempt to broadly renovate the Italian bankruptcy framework. The key element is the shift from an outdate punitive attitude - aimed at eliminating insolvent firms from the market - to a new approach finalized at first identifying and then rescuing insolvent firms, acting promptly to avoid business failures and preserve the common interest of business continuity.

In a few words, the objective of this research work is essentially to analyze and test the effectiveness of such predictive instruments in preemptively detecting the occurrence of a crisis or insolvency state, adopting a retrospective approach on the observation of an extensive set of Italian companies. But stating that highlighting such effectiveness is the ultimate goal of this whole research work would not reflect the true contributions of this study. More precisely, we want not only to test the predictive ability of such indicators, but also to understand and balance pros and cons of the whole system, in attempt to obtain a clear view of its implications and make some reliable expectations on the outcomes that the introduction of the Reform will be producing.
The compliance of the new Code of business crisis and insolvency will indeed generate costs, especially in terms of efforts required to adapt the enterprises organizational structure to duties and requirements that companies will have to face. What I am wondering is whether the preemptive protection pursued by the new framework will be worth such costs, both on an individual-firm perspective and from a systemic point of view.

In particular, the empirical analysis consisted in the definition of a population of Italian unlisted companies, comprised in a time frame of observation that spans from 2010 to 2019. Afterwards, a panel logistic regression model has been run on a subset of insolvent firms, combining a dataset of variables with the goal to understand *ex post* the predictive capability of the alerting system.

This study demonstrates that the existence of a state of alert and the emergence of a business crisis in the following period is positively correlated, thus suggesting that the system of Indicators is indeed effective in its functions.
However, such effectiveness in detecting a state of crisis is proved to be effective only in the short term, since they can foresee the emerging of a crisis only in the first following year. This evidence makes us question about the real effectiveness in enabling firms to avoid a crisis and its effects, because there is very little room for corrective actions to take if the time lag between the state of alert (induced by the Indicators) and the occurrence of the crisis is typically one year. Only considering the physiological long time it takes to practically compute the indicators and start an alerting procedure, for most of the companies (arguably, all of them) it would be literally too late to act.

Chapter 2 gives an overview on the rationales justifying the new Reform, describing the current Italian scenario and providing a brief yet exhaustive presentation of the regulatory framework. Afterwards, an extensive literature review on the topic of business failure is presented in Chapter 3, making the point on the most relevant scholars and research contributions at international level. Here, I have focused the attention on the definition of business failure, the causes and symptoms of crisis, and the methodologies utilized to predict the emergence of business crisis and insolvency. Chapter 4 is dedicated to the empirical analysis, introducing the research methodology, the construction of the dataset and the explanation of the variables included in statistical model.

The results are thus presented in Chapter 5, followed by the discussion of their interpretations and implications in Chapter 6, concluding the dissertation.

2. The new Code of Business crisis and insolvency: an overview of the Reform

In this section, we will go through the main aspects of the Regulation. First, I will briefly discuss the rationale behind the new Italian Code of business failure, as well as a comprehensive overview of the current scenario of bankruptcy and insolvency proceedings in the national economic context. Secondly, the general principles of the whole Reform will be briefly enumerated. Then, we will focus on the alerting and assisted settlement proceedings and reporting requirements enforced by law. Finally, the central element of the work will be introduced, that is the default risk indicators. Therein, the scope of the discussion will primarily include the technical implication, such as the selection methods and the limitations of the framework.

2.1 Reasons behind the Reform

The Italian Code of Business Crisis and Insolvency addresses the necessity of an organic reform of business failure and bankruptcy framework, in attempt to restore a linear body of rules harmonized with European and supranational recommendations.

Several modifications of the past framework have occurred across the decades, gradually and deeply changing the original legislation defined in 1942 (Regio Decreto 19 marzo 1942, n. 267). But these interventions have also emphasized the differences between reformed and unchanged dispositions, enhancing difficulties in the application of the norms, inducing litigations and causing slowdowns in the time it takes for bankruptcy procedures.

The reform of regulations regarding the business crisis and failure is intended to completely innovate the framework of the Italian Bankruptcy Law. The original approach of the legislation was mainly oriented to the elimination from the market of insolvent firms, with the objective of minimizing as much as possible the corresponding damage for creditors and leaving only few marginal solutions for debtors, yet depending on merit requirements. In a few words, the previous legal framework considered insolvency as something that is always a consequence of either lack of management capabilities or even frauds. For such reasons, punitive actions were believed necessary. The new framework takes inspiration from a clear principle: business crisis and failure regulations must aim at preserving the value of the firms for the sake of a common purpose, rather than liquidating their assets for the mere restorations of creditors' rights. Such new orientation basically comes from the objectives set by international and supranational institutions. For instance, the recommendation n. 2014/135/UE was intended to encourage the European States to establish a normative framework that makes effective restructuring measures available for firms in financial distress, with a rewarding approach for honest and well-intentioned owners and managers. It is specified that regulations should enable firms to access settlement and restructuring procedures in an early phase, as soon as the likelihood of insolvency becomes significant. The *model law* principles in matter of insolvency, defined by UNCITRAL (United Nations Commission On International Trade Law), go in the same direction. We should also recall the proposals of the European Parliament and the European Council on 22nd November 2016, regarding preemptive restructuring frameworks and measures intended to increase the effectiveness of insolvency and restructuring procedures.

It was therefore necessary to renovate the whole context, in attempt to provide supporting and advising means for early restructuring of financially distressed firms.

The Reform is defined in such a way that it challenges some endemic cultural characteristics of Italian companies, responsible of causing delays in addressing business crisis and lack of competences in handling it. If a prompt detection of financial troubles is ensured, the total corporate value can be maximized, rather than eroded, pursuing an overall advantage for creditors, employees, owners and the whole economic environment.
In view of this, the most innovative element of the Code is the arrangement of the "alerting instruments and assisted settlement proceedings", intended to ease the emerging of financial distress. The underlying idea is the introduction of a meeting-point between debtors and creditors' needs, with a "mediating" approach assisted by professional organisms.

In conclusion, the establishment of a systematic framework with clear and identifiable general principles will simplify the application of default procedural rules, with a positive effect on the interpretation and consistency of case-laws, combined with the adaptation to international standards, which will eventually generate an ultimate leveraging effect on the efficiency of the Italian economic system, in such a way to make it more competitive in the European and global scenario.

2.1.1. Scenario analysis

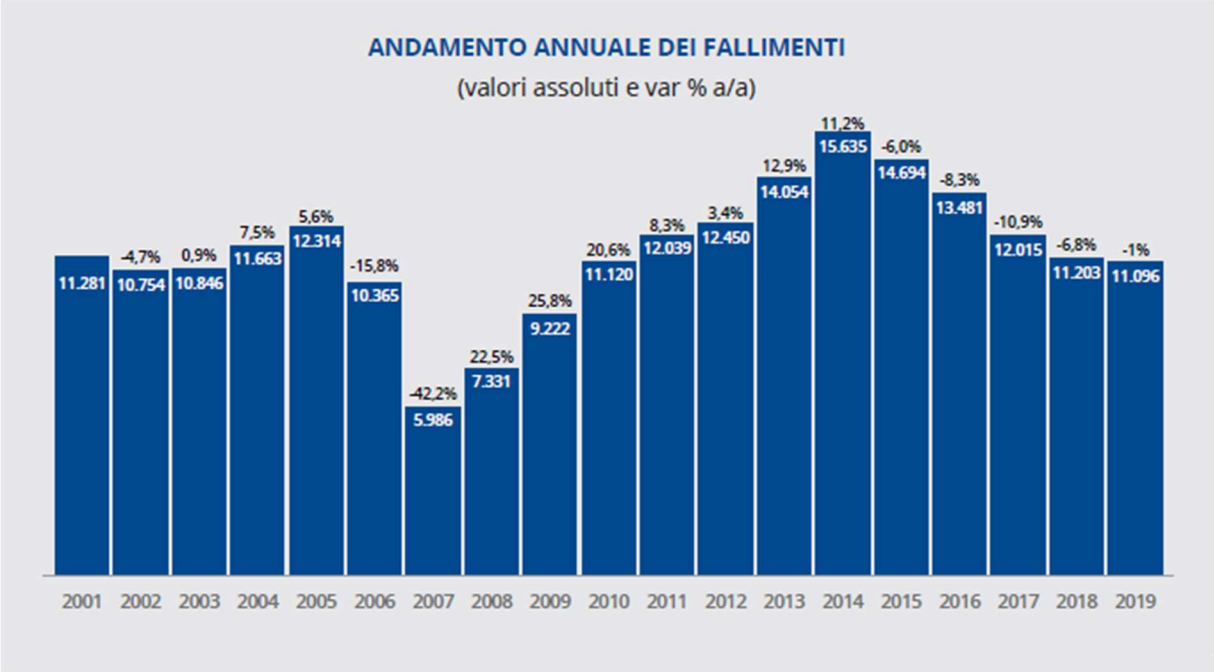
The periodic reports published by Cerved, concerning bankruptcy procedures, provide a clear snapshot of the Italian scenario focusing on dynamics and patterns that shape the overall performance of the national business environment, in terms of failure and insolvency.
Data show a general positive trend of bankruptcies and insolvency proceedings in Italy during the past 5 year. In 2019, 90.649 companies have been forced out of the market for any bankruptcy proceedings or voluntary liquidation, substantially consistent with 2018 data (+0.4%), which has been the lowest point since 2005, when 90.269 firms shut down.
If we focus the analysis on Bankruptcy proceedings, the highest level occurred in 2014, when 15.336 companies closed the gates and the highest point of the consequences derived from the traumatic global recession was reached. From 2015, there has been a

gradual and consistent improvement in the evolution of such proceedings, and in 2017 the number of bankrupted firms was -10.9% lower than 2016 (12,015 bankrupted firms in 2017), representing the largest annual decrease during the period considered. In 2019, the lowest point has been reached with 11,096 firms bankrupted, essentially the same figure as 2010.

But if we look closer at the data, we notice that the propulsive thrust of the post-crisis period is eventually coming to an end. It is straightforward to observe that the positive trend seems to slow down if we reduce the scope of analysis to the data referring to 2019. Bankruptcies are only 1% less than 2018, which is clearly not a very positive figure considering that bankruptcies have been decreasing at an average rate of 8% per year between 2014 and 2018.

This is even more clear if we consider quarterly data in 2019, during which the overall improvement above mentioned is mainly due to results of the first half of the year. But bankruptcies reportedly started to increase in the third quarter (+4.7% of annual basis) and in the fourth quarter as well (+2.6%), which represented the end of a quarterly positive trend that has been going on for 15 quarters in a row. This is the first considerable slowdown of the evolution since it started in 2015.

Figure 1. ***Annual trend in defaults***



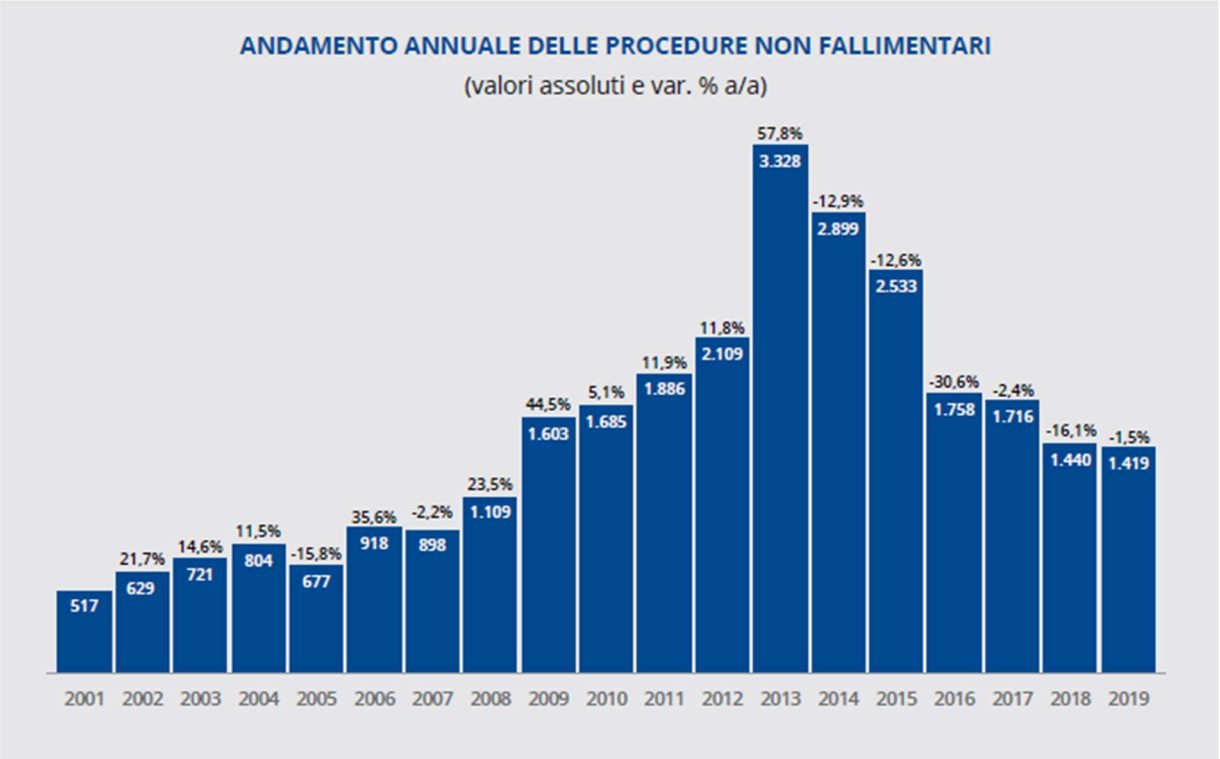
Source: Cerved

It is also interesting looking at the causes of such turnaround, mainly generated by limited companies' bankruptcies, which account for 77% of defaults (more than 8,600 cases, +1.9% from 2018). Other categories of company keep on improving their figures, such as sole proprietorships that register -10.9% fewer bankruptcies (1,408 total cases) than 2018, and partnerships (i.e., *società di persone)* with -8.3% than 2018 and less than one thousand cases.

As far as industries are regarded, reports show that bankruptcies cases are particularly prominent in manufacture and services sectors.
In the former industry, firms have seen an increase by 0.7% on annual basis. In particular, bankruptcies in consumer products segment have boosted by 26%, which is the largest and most alarming data in the industry.
When it comes to services, proceedings are 0.8% more than 2018. The worst performing segments are real estate (+7.7%), logistics (+2.8%) and distribution (2.1%), which most contribute to the overall increase.
On a territorial basis, the trend is quite heterogeneous. Defaults are increasing in the South and in the North East, while decreasing in the North West and in the Center.

Regarding other default proceedings, the pattern is quite similar. After a significant reduction during the last years started in 2015, they have come to their lowest point in 2019 with 1,419 cases (-1.5% than 2018). Nevertheless, it is evident that the positive trend is slowing down in this case as well. It is primarily correlated with data regarding the cases of arrangements with creditors (i.e., concordato preventivo), that switched from 500 in 2018 to 525 in 2019 (+5%). The increase is mainly due to the negative results of the first semester, during which the number was even 19.6% greater than the same period in 2018, and was not outweighed by the -9.6% drop in the second half of the year, compared to the second semester in 2018.
On the other hand, compulsory liquidations keep on decreasing, resulting in -6% fewer than 2018.
Even more evidently than bankruptcies, insolvency proceedings show very different evolutions with respect to industries. They are still decreasing in services sector, with a -3.7% on annual basis in 2019, thanks to the sharp drop of compulsory liquidations and other forms of proceedings (-4.4% and -8% respectively) which more than compensated the increase of arrangements with creditors (+4%).

Figure 2. ***Annual trend in non-bankruptcy procedures***



Source: Cerved

In the construction industry, many more firms have filed for insolvency proceedings, registering +5% in 2019 especially caused by a boost in arrangement with creditors (+20% compared to 2018).

Nevertheless, the trend looks quite homogeneous across the country, with a general slight decrease in 2019, except for North East. Indeed, in this area the number of cases has registered a +15.2% increase from previous year in 2019, in part deriving from a strong growth of compulsory liquidation (+37% on annual basis).

These data factually outline the Italian context in matter of business failure, which seems to be not so cheering in view of the next years. Furthermore, we can reasonably expect that the impact of the pandemic on the global economic environment will have serious consequences. We have seen that the positive trend of bankruptcy and insolvency proceedings in Italy is coming to an end. Furthermore, we can reasonably expect that Covid-19 will make this shift even more drastic, considering that the Italian economic framework is exceptionally exposed to the economic downturns of the pandemic, due to the strong strategic importance of those industries that have been heavily affected by restrictions.

2.1.2. The European Commission Recommendation

The European Parliament, in its Resolution of November 17, 2011, noted that the disparities between national insolvency laws could jeopardize the success of restructuring operations of insolvent companies, thereby encouraging the deplorable phenomenon of so-called forum shopping. From another point of view, the European Parliament, with the same measure, while noting the impossibility of achieving a common substantive law on insolvency for all member states, had noted the existence of areas of corporate crisis law in which harmonization would be very useful and relatively easy to implement (Vitali, L.M., Miramondi, M.).

Therefore, the European Parliament had requested the European Commission to formulate one or more legislative proposals in the field of insolvency.

The European Commission responded to this Resolution with two important initiatives: the first consisting of the revision of EC Regulation no. 1346/2000 (regarding the regime applicable to so-called cross-border insolvencies) and the second represented by the Recommendation of March 12, 2014 under consideration here.

In this regard, it is worth noting that many of the elements contained in the Recommendation can be found - as they are already provided for - in the Italian bankruptcy law and, in particular, in the set of rules applicable to the arrangement with creditors, which in recent years has been the subject of radical and "orthopedic" interventions by the legislator which have significantly changed the rules.
It should first be clarified that the Recommendation analyzed here does not apply to insurance companies, credit institutions, investment companies and, more generally, to other financial institutions subject to special recovery and resolution regimes in which national supervisory authorities enjoy broad powers of intervention. On the other hand, national legislators are free to extend the application of the principles expressed in the Recommendation also to consumers, even if they are not explicitly the recipients.

On the other hand, with reference to the aims pursued, the measure adopted by the European Commission intends, first of all, to encourage "early" restructuring of companies that find themselves in a situation of temporary financial difficulty, so as to prevent insolvency and avert the negative effects that this circumstance entails, not only for the debtor but also for creditors and, more generally, for the economic-productive system.

The Recommendation in question also aims to encourage the so-called "fresh start", i.e., "the reintegration into the economic context of entrepreneurs who have already been subjected to proceedings", in the wake of certain European Union statistics which show that, of the entrepreneurs currently operating successfully, 18% had failed their first attempt.

According to the European Commission, these objectives can only be achieved through ad hoc interventions on the part of national legislators which - in a perspective of harmonization between the various legal systems of member states - are aimed at "reducing the divergences and inefficiencies that hinder the early restructuring of healthy companies in financial difficulty and the possibility for honest entrepreneurs to obtain a second chance". To this end, the measure under review has provided "minimum standards for (a) preventive restructuring frameworks, and (b) debt relief for bankrupt entrepreneurs" to which the member states must be inspired when implementing the Recommendation.

As regards more specifically the preventive restructuring of companies in crisis, the European Commission has invited member states to prepare a regulatory framework that allows the debtor to access restructuring measures and procedures "as soon as it is clear that there is a likelihood of insolvency", without, however, this initiative entailing the debtor in crisis losing direct control of the management of the company.

The European Commission also hopes that the restructuring procedure will be structured in such a way as to be carried out rapidly and with limited costs, limiting recourse to the

judge only in cases where it is effectively necessary and functional to better protect the rights of creditors and third parties.
As anticipated, the other macro-objective of the measure under review is to allow the "honest but unfortunate" entrepreneur to enjoy a second chance. The Recommendation has therefore foreseen that the entrepreneur be allowed to benefit from the full release of the debts involved in the crisis resolution procedure after a maximum of three years from the date of bankruptcy, in the case of liquidation procedures, or from the implementation of the restructuring plan, in the case of reorganization procedures.

Initial comments on the Recommendation in question have been overall favorable, although there have been some criticisms which, albeit briefly, should be taken into account.

In particular, although the contents of the measure adopted by the European Commission have been appreciated, some doubts have been aroused by the regulatory instrument chosen to convey its implementation in the legal systems of member states, i.e., the Recommendation, which, given its non-binding nature, could result in an intervention with little practical impact.

2.1.3. General principles

The objective of the new Code of business default and crisis is to ensure a timely detection of the state of crisis and to defend the entrepreneurship, in such a way that restructuring and settlement activities can be started and carried on preemptively. It might be useful to wrap up the abovementioned arguments, which can be summarized in three broad goals: reforming organically with respect to insolvency proceedings and over-indebtedness crisis; simplifying the overall regulation, in order to overcome interpretative barriers due to contradictory jurisprudences and practices; guaranteeing the legal certainty and improving the efficiency of the economic system so as to make it more competitive.

The alerting risk indicators are the core elements of this research work. However, it is useful to introduce the argument with a brief illustration of the main characteristics of the whole Reform. The articles from 1 to 11 provide the general provisions of the new regulation, as they clarify the fields of application, definitions, requirements and obligations. We can summarize the principal aspects as following:

a) The term "*fallimento"* (e.g. bankruptcy) is replaced by *"liquidazione giudiziale"* (e.g. judicial liquidation).

b) The expression "state of crisis" is introduced, meaning a condition of likely future insolvency.

c) One single procedural model is adopted for the assessment of the state of crisis (or insolvency) of the debtor, which is particularly fast.

d) The discipline related to the different procedures embodied in insolvency regulation is simplified and standardized.

e) The length and costs of proceedings are reduced.

f) More harmonization is provided, with respect to crisis and insolvency settlement proceedings and protection of employees' income.

g) The entrepreneur must adopt all the required organizational actions apt to deal with the state of crisis. Reporting and transparency requirements are set as important cornerstones.

2.2. Alerting instruments and assisted settlement procedures

2.2.1. Objectives and fields of application

As stated earlier, one of the objectives of the reform of the discipline is to radically renew the framework of the Bankruptcy Law, whose approach was mainly oriented to "eliminate insolvent firms from the market, with as little damage as possible for creditors […]" (Rordorf Renato, 2019). The basic assumption was that, in case of insolvency, the cause had to be found in the entrepreneur's incompetence or fraudulent activities. This is why the discipline was intended to adopt a punitive approach.

We already mentioned the role of European guidelines in 2014, that redesigned the underlying justification for the discipline of business crisis, according to which

regulations should aim to defend the value of the company. For this purpose, it is crucially important that the entrepreneur is enabled to adopt prompt procedures in order to overcome the crisis. This explains the introduction of the most innovative feature of the whole Reform, namely the alerting instruments and assisted settlement procedures, whose aim is to facilitate the early emerging of the crisis and promote deals between the debtor and his creditors.

The discipline is articulated in two essential phases:

- The alerting phase, defined "alerting instruments" regulated by Articles 12-18
- The second phase, named "assisted crisis settlement proceedings", regulated by Articles 19-23.

The entrepreneur (and the subjects obliged to report) should signal the state of crisis in a very short time and autonomously activate the settlement proceedings. In case of inaction, the obliged subjects will give rise to the alerting report procedure.
According to the Code, the actors involved in the new regulations are:

- Debtors conducting business activities
- Agricultural entrepreneurs and "minor" entrepreneurs.

Conversely, subjects excluded by the discipline are:

- Large companies
- Large corporate groups
- Listed companies
- Companies with shares widely distributed to the general public[1]
- Companies with specific business activities, just like banks, insurance companies, investment companies and trust companies.

It is important to remind that the Code gives a clear definition of business crisis, described as "a state of economic-financial imbalance that makes it probable that the debtor will become insolvent, and which for companies manifests itself as the inadequacy of prospective cash flows to meet planned obligations on a regular basis".

[1] Companies that: have more than 500 shareholders different from the controlling shareholders who hold a total of a percentage of share capital of at least 5%; do not have the possibility of drawing up the financial statements in abbreviated form in accordance with the first paragraph of Article 2435a, of the Civil Code.

This definition is a new one provided by the corrective decree n. 147 on 26th of October 2020, slightly different from the former version.

2.2.2. Alerting instruments and organizational and reporting obligations

Alerting instruments are made of two categories of obligations: organizational requirements (for entrepreneurs) and reporting obligations (for qualified entities), both finalized to the early identification of crisis evidence, which can be divided into:

1) Internal requirements:

- *Organizational requirements for entrepreneurs and management*, whose obligation is to create an organizational framework capable of ensuring a prompt identification of the crisis and, afterwards, immediately initiating settlement proceedings. The organizational, administrative, and accounting structure of the company should be defined with respect to the dimensions and the characteristics of the business. Here, it suffices to point out that the management is not necessarily obliged to resort to the assisted settlement proceedings with the OCRI. Indeed, no reward measure[2] is justified and issued in such a case.

- *Monitoring and reporting obligations for supervisory boards, auditors and (in some circumstances) banks and financial intermediaries*. These subjects have the duty to constantly monitor the appropriateness of the organizational set-up of the company and promote the required activities to fix the administrative structure. Furthermore, they must constantly verify the business and financial stability of the firm and forecast future performances. Eventually, they must detect the existence of dangerous default risk hints. In fact, when the supervisory board identifies inadequacies in the organizational structure or solid crisis clues, it must rapidly report to the company management. If the latter provides effective and acceptable solutions, then the supervisory board has reached its own goal and does not go further with external reporting activities, since corrective actions will be held within the boundaries of the

[2] Incentive system that promote entrepreneurs to adopt the adequate measures to facilitate the early emergence of the crisis, in order to rapidly put an end to it.

firm. On the other hand, if the management provides responses considered insufficient, or does not provide any response at all, then the supervisory board is forced to inform the OCRI (the crisis settlement body introduced by the Reform, as we will see further).

2) External requirements:

- *Reporting obligations of the entrepreneur and the control body of the companies*

For individual entrepreneurs, the Code specifies the duty of taking appropriate measures to promptly detect the state of crisis, recalling to set an organizational, administrative and accounting structure that is appropriate to the nature and size of the company, also in view of the timely detection of the company's crisis, also in view of the timely detection of the crisis of the company", as declared in Art. 2086 of the Civil Code.

With regard to collective entrepreneurs, the obligation to set up an adequate administrative organizational structure was already inferable from the duty of professional diligence required of the directors of companies with share capital, but it has become more specific by virtue of the conception that the crisis is a typical and physiological event of the life of the company and, as such, requires the entrepreneur to organize himself in such a way as to foresee it.

- *Reporting obligations of internal supervisory bodies*

The company's supervisory bodies, the auditor and the auditing firm, each within the scope of their respective functions, are first and foremost obliged to verify that the administrative body is constantly assessing the adequacy of the structure to allow for the detection of the crisis, taking any necessary action to this end.
They are also obliged to ascertain whether the economic and financial equilibrium exists and what the foreseeable trend of operations is.
Finally, they are obliged to point out the existence of well-founded indications of the crisis, by means of a verification that is not limited to the verification of violations of the Indicators referred to in art. 13, paragraph 2, but must extend to any situation that assumes relevance in accordance with the paragraph 1 of such provision.

- *Reporting obligations of qualified public creditors*

The external subjects involved are the Agenzia delle Entrate (Internal Revenues Service), INPS (Social Security Service) and the collection Agent in charge. According to the regulation, when the level of indebtedness of the firm overcomes certain levels (ex Article 15), the abovementioned entities should first inform the debtor. Within 90 days, the debtor company must either pay off (or fully adjust) its debts or initiate the application for the assisted settlement of the crisis or send the request for insolvency procedures. In case of debtor's inaction beyond that deadline, the public creditor must report to the OCRI. Furthermore, in the event that the qualified public creditors do not comply with their reporting obligations, *Agenzia dell'Entrate* and *INPS* will lose the prerogative on their credits, whereas the collection Agent will lose the unenforceability of the credit for costs related to the collection (Salvato, 2020).

2.2.3. The *OCRI (Organismo per la Composizione della Crisi e dell'Insolvenza)* and the alerting procedure

The OCRI (Body for the Composition of Crisis and Insolvency) is a new body, introduced with the reform, which will have to be established at each Chamber of Commerce.
It is entrusted, according to art. 16 of the Code, with the task of:
i) receiving reports of indications of the crisis;
ii) overseeing the alerting procedure that is activated as a result of the report;
iii) managing the alert procedure and assist the entrepreneur, at his request, in the assisted crisis settlement procedure.

To date, the structure of the OCRI is not yet exactly identified: we know that the contact person will be the fulcrum of the body and will probably be the secretary of the Chamber of Commerce where the OCRI will be established or a person delegated by him. The territorial competence of the OCRI is linked to the place where the registered office of the company is located, but nothing is said about the hypothesis in which the report is sent to an incompetent OCRI. (Cipolla, 2020)

Once the report has been received, the contact person must inform the bodies of the company and set up the Board of three experts who will deal with the management of

the crisis. The three members of the Board are appointed as following: one by the President of the section specialized in business matters of the competent Court; one by the President of the Chamber of Commerce; one will be a subject belonging to the association representing the debtor's sector of reference, identified by the OCRI's contact person, after having heard the debtor, and to be selected from a list to be sent annually to the contact person of the business association.
Within 15 days of receiving the debtor's report or request, the OCRI convenes the debtor as well as the members of the supervisory bodies (if present) for a confidential hearing before the Board of arbitrators which, as seen above, the contact person will have constituted.

In the absence of an analytically described procedural procedure, it is foreseen that, after hearing the debtor and taking into account the elements of evaluation provided by the debtor as well as the data and information gathered, the OCRI may:
(i) order the filing of the report received when it considers that the crisis does not exist or that it is an entrepreneur to whom the alerting instruments do not apply;
ii) order the filing when the corporate supervisory body or, in its absence, an independent professional certifies the existence of tax credits or other receivables from public administrations for which 90 days have elapsed since the notice of default, for a total amount that, taken as compensation with debts, determines that the thresholds referred to in Article 15 have not been exceeded;
iii) if it considers the existence of the crisis, the Board shall assist the debtor in identifying possible measures to remedy and set a deadline for the debtor to report on their implementation.
While one of the legislator's objectives is to guarantee the confidentiality of this phase to the debtor, in order not to create unnecessary alarms, it is clear that ensuring such confidentiality will not be easy (Cipolla, 2020).

2.2.4. Assisted crisis settlement procedures

This procedure, which presupposes that the debtor shares the existence of a state of crisis, can only be opened on the debtor's own initiative and is the most advanced stage of the alert procedure. If the alert phase has already been initiated, the procedure will

start from a request by the debtor directly to the contact person, otherwise from an alert to the OCRI. Once this phase has started, the entrepreneur begins a "guided" process that leaves little room for individual initiative.

First, it is worth pointing out that, in this phase, the debtor may not be assisted by professionals he trusts: this conclusion is reached by reading art. 6 of the Code which excludes the predeductibility of the credits of the entrepreneur's professionals, recognizing it only to the members of the college appointed by OCRI, thus discouraging the use of professionals trusted by the entrepreneur.

Once this process has begun, the college will assist the debtor in finding an agreement with its creditors, managing negotiations with them and assisting the debtor in the preparation of all the documentation useful for negotiations and the formalization of agreements. In this way, if the debtor comes to the conclusion that he wishes to access one of the crisis regulation procedures, the board of arbitrators will act as an attestation of the truthfulness of the company data.

This process, aimed at reaching an agreement with creditors, must be concluded within three months, which may be extended for another three months, from the start of the proceedings.

During this period, the entrepreneur will have access to the precautionary and protective measures provided for by Article 54 (such as the appointment of a custodian of the company or the blocking of executive and precautionary actions) by making a request to the Companies Section of the Court of the territorially competent Court, which will grant such measures only after consulting, in addition to the entrepreneur, also the chairman of the board set up by OCRI and those who have made the report that initiated the alert.

The duration of these measures may not exceed three months, which may be extended for a period not exceeding the duration of the procedure and in any case on condition that the panel certifies that there are real improvements in the negotiations with creditors.

At the end of the procedure this may happen:

(i) no agreement has been reached with the creditors. In this case, the Board will invite the entrepreneur to access one of the crisis and insolvency regulation proceedings within 30 days. If this is not the case, the Board of Statutory Auditors will inform the Public

Prosecutor that, if it deems that the conditions are met, it must formulate a request for the opening of judicial liquidation (formerly, bankruptcy) pursuant to Article 38;
ii) an agreement has been reached. If this is not the case, the Board of Statutory Auditors will inform the Public Prosecutor that, if it deems that the conditions are met, it must formulate a request for the opening of judicial liquidation (formerly default) pursuant to Article 38;

ii) that an agreement has been reached. In this case the agreement will have all the characteristics of the certified recovery plan (now governed by Article 56 of the Code).

To the "virtuous" entrepreneur who has complied with the regulatory provisions on the initiation of the alert and the composition of the crisis, following the indications provided by the Board, the reward measures provided for by the Code will be applied.

The measures consist of a series of benefits, which can be accumulated, operating on three levels:

x) some benefits consist of measures aimed at avoiding an increase in the stock of liabilities (art. 25, paragraph 1, letters a, b, c);

x.1) other benefits are procedural in nature and concern the procedures for presenting applications for composition with creditors and debt restructuring agreements (art. 25, paragraph 1, letters d, e);

x.2) finally, other benefits relate to the criminal consequences and consist of the provision of grounds for non-punishment or a reduction in punishment, if certain offences are foreseeable (art. 25, paragraph 2).

In the event that the debtor has submitted an application for settlement of the crisis, the debtor may ask the chairman of the board of the OCRI (or OCC) that has dealt with it to issue a certificate of “timeliness of the request”.
It is doubtful whether this certification is a necessary condition for the applicability of the benefits. It is preferable to opt for the positive solution [88], with the caveat that in the crisis and insolvency regulation procedure the existence of the requirements can be

contested. What is expressed in article 24, paragraph 2, does not imply that the benefits require that the composition procedure must have been preceded by the alert procedure. The timeliness of the initiative is a necessary condition, but not sufficient, for the the applicability of the benefits.

2.3. Alerting Indicators

In this chapter, we will learn more about the technical aspects and implications of the Indicators introduced by the Reform. Most of the following data and observation are extrapolated by the document " Crisi d'Impresa – Gli Indicatori dell'allerta", issued by the Consiglio Nazionale dei Dottori Commercialisti e degli Esperti Contabili (from now on, CNDCE), which is the Italian national Council of expert accountants.

2.3.1. Selection method

The chosen model is to be considered a multivariate model, built through a "combined" logic, in which the evaluation of the selected indices has resulted in the simultaneous evidence of a combination of overruns of thresholds, whose joint emergence was historically associated with a high probability of leading to insolvency. The analyses were based on the identification of a combination of indices representing imbalances of an income, equity or financial nature which, taking into account the sector-specific nature of the company, made it possible to identify crisis situations.
The risk that false signals emerge from the indices, and in particular false positive signals. requires the development of best practices to corroborate the signals provided by the indices, in order to intercept and adequately motivate the well-founded clues.
For the selection of the indices, the signals widely used in business practice and in early diagnosis models of corporate insolvency were taken into account, examining about fifty ratios that are related to the following management areas:

sustainability of financial charges and debt;

- degree of capital adequacy and composition of liabilities by nature of sources;
- financial equilibrium

- profitability
- development
- indicators of specific payment delays.

The analysis was aimed at selecting the balance sheet ratios that, when properly dichotomized and combined, would best identify a cluster of companies close to insolvency (Consiglio Nazionale dei Dottori Commercialisti e degli Esperti Contabili, 2019). The selection phases can be summarized in two macro steps:

- univariate statistical analysis of the indices, which made it possible to identify the short list of candidate indices for each area surveyed
- multivariate analysis of the indices selected in the first step with alternative approaches, which allowed the identification of the signals that appropriately combined maximize the set objective.

In order to select the short list of the most predictive indicators, analyses were carried out of the univariate predictive capacity (of the single index) of the insolvency event three years after the date of the last financial statements.
The predictive capacity of the indicators was evaluated on the basis of the following metrics:

- Accuracy Ratio (or Gini index)
- Difference in medians of indicators between "bad" (insolvent) and "good" (non-insolvent) enterprises
- Evolution of insolvency rates for quantile of the indicator, with particular attention to the effectiveness of the indicator in the tail of the distribution (risk area).

An alert system requires the selected index to be effective especially in the riskiest tail of the distribution and not affected by computational problems that may affect its effectiveness.
This important aspect has been evaluated in the qualitative analysis and interpretability phase of the indices together with aspects such as completeness of information, simplicity of calculation, representativeness for the area of analysis, economic interpretability, practice of use, etc..

Moreover, in an attempt to identify the indices that provide the most original information content, the levels of correlation between the various indices were also considered when identifying the short list.
With this approach, the most representative indices were identified for each area of analysis, which were subsequently analyzed in a multivariate key.

2.4. The system of Indicators

The Indicators are expressed in the first and second paragraph of Article 13 of the Code. Those in the first paragraph are related to all the companies, without distinction; the indicators shown in the second paragraph are characterized by different "industry specific" threshold values.
The system is hierarchical and must be applied according to a pre-selected pattern. When the first threshold value (i) is exceeded, the presence of the crisis is made conceivable. If the first (i) is not exceeded, the second (ii) is verified, and if its threshold is exceeded, the crisis can be hypothesized. In the absence of the data, we move on to the group of indices referred to in Art. 13, para. 2.

The Indicators are the following:

(i) Negative net equity
(ii) six-months DSCR less than 1
(iii) if DSCR is not available, joint exceedance of the thresholds described in the five industry-specific indices, which will be enumerated further in the reading.

2.4.1. Negative net equity

The Negative net Equity is the first alerting indicator selected by the CNDCEC, in order to promptly detect the symptoms of potentially incurring state of business crisis.

It is determined by summing Shareholders' Equity, reserves and net results. It may become negative, when losses greater than the sum of the abovementioned figures.
For all the enterprises with a negative net equity, the risk of crisis is manifest. The equity becomes negative or falls below the legal limit as a result of operating losses, including cumulative losses, and is a cause for the dissolution of the company, according to the Italian Civil Code. The choice of this parameter as a fundamental one for the alerting system of the Reform leaves us in doubt regarding the choice of the Negative net equity: indeed, there are already several automatic mechanisms which are activated by Civil Code, when excessive losses dangerously erode the Net Equity, even way before it becomes negative (see Art. 2327, 2446, 2447, 2482-ter, 2483-ter, Civil Code). In practice, this may not represent a significant novelty in the discipline. Moreover, we can state that a situation of Negative Net Equity might not necessary conditionate the capability of a company to keep on doing its business in a proper manner. The company may in fact be capable of meeting its liabilities, thanks to good levels of working capital and/or its capability of generating positive cash flows. This aspect makes it legitimate to expect an high level of companies that will go into alert, yet being substantially healthy, with all the undeniable negative consequences that the status of alert might involve, both in terms of costs and reputation.

With reference to partnerships, the system proposed by the CNDCEC conflicts with the position of the Supreme Court, which affirms that in partnerships (e.g., società di persone) there is no obligation to cover losses, but only the burden of covering them if profits are to be distributed, as there is a ban on the distribution of profits in the presence of losses. In these companies, therefore, the loss for the financial year can be postponed to future financial years while waiting to be covered by the production of profits, by the payments made by the shareholders, with the pre-existing reserves or by reducing the capital to the extent of the losses.
The reason for this choice derives from the fact that creditors in partnerships are not protected by the share capital but by the unlimited and joint liability of the partners for the obligations assumed by the company itself.
The Civil Code's regulation of losses is different for corporations where capital represents the only form of protection for creditors.

Finally, as a Negative Net Equity is typically originated by accumulated losses, it can also be considered as a consequence of organizational inefficiencies affecting the business performances, that already started much earlier that the emerging of the situation of Negative Net Equity. In such cases, when this condition is assessed, it may be too late to save the business continuity.

Monitoring shareholders' equity is in fact already the task of the management, the board of statutory auditors and the statutory auditor, who must verify the existence of the prerequisites for business continuity. These parties will detect any negative net assets indicatively in April/June of the following year when the ordinary shareholders' meeting is convened to approve the financial statements for the previous year. Therefore, if these parties ascertain a negative net worth, this could be the consequence of a crisis which began even a year earlier and it is too late to intervene; the only possible course of action could be liquidation.

In a few words, my doubt here is that the diagnostic approach pursued by the Reform should be reflected in monitoring on prospective data, rather than historic figures just like the Net Equity.

Finally, it should be pointed out that art. 13 of the Code of business crisis does not identify the frequency with which shareholders' equity must be subject to verification, but an indirect indication can be drawn from art. 24 paragraph 1 letter c) of the Code of business crisis, regarding bonus rewarding measures. In fact, it envisages that reference can be made not only to the latest approved financial statements, but also to interim situations, even on a quarterly basis.

The estimation of such parameter usually requires the preparation of complete financial statements, not only annually but also quarterly, as granted by Art. 24 of the Code.

The preparation of shareholders' equity on a quarterly basis is likely to be a complex and difficult requirement, destined to remain more of a wish in the legislation than a practically feasible exercise.

In fact, shareholders' equity is not a precise accounting measurement, but arises from the difference between assets and liabilities, to which the result for the period also

contributes. Its determination is a function of an articulated procedure that presupposes the formation of real quarterly financial statements, to which all the rules required for the annual report must be applied in the phase of adjustment and adjustment of values.
In the case of companies that find themselves in a situation close to a crisis and that present a modest equity solidity, the determination of an "approximate" balance sheet is not even conceivable, since the borderline between a positive value and a deficit is often very limited.

You should bear in mind that the companies towards which this new system is addressed are typically SMEs that do not have proper organizational and accounting systems. Completing quarterly financial statements can generate significant costs and difficulties, especially for firms that are facing financial distresses.
Irrespective of the financial situation, the CNDCEC has considered this circumstance as a detrimental condition, regardless the arguments explained above, to the company's ability to continue as a going concern. In such situation, the recapitalization may be necessary.

2.4.2. Debt Service Coverage Ratio (DSCR)

It is also a crisis index that applies for all companies the presence of a six months-DSCR less than 1. The DSCR is calculated as the ratio between the free cash flows expected in the following six months that are available for the repayment of debts expected due over the same period. If the resulting values are greater than one, they testify the estimated capacity of sustaining of the debts over a six-month horizon; if values are lower than one, the relative inability of sustainability of the debts is indicated.

2.4.3. Industry-specific indicators

It may occur that the equity is positive and the share capital is above the legal limit; it may also be the case that the DSCR is not available or is deemed not sufficiently reliable, due to the inadequate quality of the prognostic data. In such cases, the following 5

indices are adopted, with different thresholds depending on the sector of activity. Furthermore, these specific indices must all be alerted together:

a) *index of sustainability of financial charges*, in terms of the ratio of financial charges to turnover. It measures the sustainability of debt charges with the cash flows that the company is able to generate
b) *capital adequacy index*, in terms of the ratio of shareholders' equity to total debt;
c) *index of liquid return on assets*, in terms of the ratio between cash flow and assets. Just like the index of sustainability of financial charges, it defines the sustainability of debt charges with the cash flows that the company is able to generate.
d) *liquidity index*, in terms of the ratio of short-term assets to short-term liabilities. It compares the liabilities payable in the short term with assets that can also be realized in the short term monetarily.
e) *pension and tax debt ratio*, in terms of the ratio of pension and tax debt to assets.

It is very important to keep in mind that these 5 indexes are significant if used simultaneously. Each one, when considered in isolation, provides only partial views of possible signs of crisis. The contextual exceeding of all 5 thresholds established for these indices is therefore required, as stated in the "unitary valuation" of the Legislator.

These indices are calculated on the basis of economic and financial data that can be deduced from the financial statements. Therefore, doubts similar to those regarding the negative shareholders' equity index may also arise for the sector indices. More specifically, the alert that the legislator wishes to trigger could prove to be untimely, in that indicators of an actual nature may not have the same precision in highlighting the sustainability of the debt in the following six months and the company's ability to continue as a going concern in the current year, as indicators based on prognostic data.
In addition, there is the risk that these ratios may not be particularly reliable as they could be calculated on items overstated by the administrative body in order to conceal the state of crisis.
The Board considers that these indices, like shareholders' equity, must be calculated every three months. It also specifies that, in the absence of approved financial statements, the evaluation must be carried out on the basis of an interim situation which must be drawn up by the company on a voluntary basis. Here, too, we may encounter a

limitation presented earlier: SMEs may encounter problems related to their lack of an internal organizational, administrative, accounting structure that enables them to have accounts updated quarterly. In addition, many SMEs do not even keep accounts in-house as they use external consultants.
Finally, preparing quarterly accounts in a crisis situation could be particularly burdensome for managers, who are already under pressure in a situation of financial difficulty.

Moreover, a report realized by Cerved in 2018 underlined that the rational behind the choice of the alerting thresholds of the indicators solely relies on industry sectors, without taking into account the size and age of companies. An evidence provided by the report is that mostly small-sized and young companies will eventually end up into alert, due to the major vulnerability in financial terms.
The same analysis has also highlighted that by applying uniform alert thresholds, it emerges that newest and youngest companies are more likely to be reported. The alerting signal for companies less than 5 years old turned on more than twice as often as for companies over 21 years old; specifically, 6.2% for newco's and 4.9% for companies from 2 to 5 years old against 2.2% for companies established over 20 years ago.
On the basis of this data, therefore, the Council, in order to minimize the risk of false positives, should have also taken into consideration the size and age of the companies when determining the thresholds. The CNDCEC, however, has limited itself to exempting innovative start-ups and companies established for less than two years from the calculation of the sector indices, identifying specific indices for them.

The following are the thresholds identified by the Consiglio Nazionale dei Dottori Commercialisti e degli Esperti Contabili (CNDCEC) in the document “Crisi d’Impresa – Gli indici dell’allerta”, in 2019:

Figure 3. ***The thresholds of the industry specific alerting indicators***

INDUSTRY	ALERTING THRESHOLDS				
	FINANCIAL EXPENSES / REVENUES %	SHAREHOLD. S' EQUITY / TOTAL DEBT	SHORT TERM ASSETS / SHORT TERM LIABILITIES	CASH FLOW / ASSETS	PENSION AND TAX DEBT / ASSETS
(A) AGRICULTURE FORESTRY AND FISHING	2,8	9,4	92,1	0,3	5,6
(B) MINING (C) MANUFACT. (D) UTILITIES	3,0	7,6	93,7	0,5	4,9
(E) WATER SUPPLY, SEWERAGE, WASTE (D) UTILITIES TRANSMISSION	2,6	6,7	84,2	1,9	6,5
(F41) BUILDING CONSTRUCTION	3,8	4,9	108,0	0,4	3,8
(F42) CIVIL ENGINEERING (F43) SPECIAL CONSTRUCTIONS	2,8	5,3	101,1	1,4	5,3
(G45) WHOLESALE and RETAIL AUTOMOTIVE (G46) WHOLESALE (D) UTILITIES DISTRIBUTION	2,1	6,3	101,4	0,6	2,9
(G47) RETAIL (I56) RESTAURANTS	1,5	4,2	89,8	1,0	7,8
(H) TRANSPORT AND STORAGE (I55) HOTEL	1,5	4,1	86,0	1,4	10,2
(JMN) BUSINESS SERVICES	1,8	5,2	95,4	1,7	11,9
(PQRS) PERSONAL SERVICES	2,7	2,3	69,8	0,5	14,6

Source: CNDCEC

For the scope of this research, the empirical analysis will be carries with respect to companies of wholesale and retail trade (ATECO 2007: 45, 46, 47) and food and restaurant services (ATECO 2007: 56).

2.5. Limitations of indicators: false alarms

In the estimation of certain parameters, it is physiological the presence of incorrect reports, also related to the size of the confidence interval. The so-called "false positives" are defined as errors of the first type, i.e. companies whose insolvency is expected, which actually will not incur in the time horizon considered; the so-called "false negatives" are defined as errors of the second type, i.e. companies whose crisis is not diagnosed, but will instead become insolvent. The accuracy of a model typically

corresponds to the ability to maximize the proper forecasts, minimizing the two types of errors abovementioned. Nevertheless, even if for accuracy purposes the errors are equivalent, false positives and false negatives do not have the same impact in terms of consequences on the system. The choice of setting the model admitting a smaller number of errors of first or second type depends on the objectives of the model itself. In this case, the CNDCEC has preferred models that minimize the number of false positives, especially considering their potential systemic impact, thus admitting the possibility of a greater number of false negatives (CNDCEC, 2019).

In view to what has been presented in this chapter, it is undeniable that the whole complex of requirements, obligations, procedures and reports introduced by the Reform will entail significative costs for the companies involved in the discipline. Considering that it is likely that firms incurring in such procedures will be also facing financial distress arising by other kinds of business inefficiencies, I wonder whether the benefits provided by the outcome of this system will eventually outweighs the objective costs that both individual firms, and the economic system as a whole, will be addressing in the application of the norms.

3. Literature Review

Business failure and corporate financial distress have been the subject of a large body of corporate finance literature. The field of business failure prediction has been the most popular topic during the past decades. The great part of the literature is focused on the detection of the most effective predictive methods, which can be classified according to the approaches used to define alerting mechanisms for the prediction of corporate crisis and insolvency.

This chapter is structured as following: the first paragraph overviews the definition of failure as addressed in some of the most relevant papers; secondly, I will discuss several perspectives of causes and symptoms of financial distress and business failure; the last section reviews and comments on business failure prediction modeling and methods, covering classic statistical approaches, artificial intelligence techniques and more recently developed ensemble and hybrid modeling.

3.1. Definition of failure

There is not a universally accepted definition of business failure and financial distress to date, since the theme has been studied from several perspectives, such as economic, juridical, financial, and econometric. The definitions provided have been varying, especially with respect to the scope and purpose of the studies. (Veganzones et al., 2020). Since the early studies on the topic, corporate failure has often been described as a binary classification, in such a way that it provides a criterion to discriminate between firms of the samples and assign each of them to a predetermined class (failed and non-failed firms).

Failure is usually intended as the situation that an enterprise has a certain kind of financial difficulties. Baever (1966) describes it as the inability of a firm to pay its financial obligations as they mature. In his pioneer paper, a firm is to be considered

failed when any of these events occur: bankruptcy, bond default, overdrawn bank account, nonpayment of a preferred stock dividend. Actually, most of the firms included in his research sample bankrupted, which make the definition of failure as bankruptcy undoubtedly the most relevant. It is clear the necessity to define failure as an objective criterion that goes beyond the subjective interpretation of scholars.
In addition, the discriminant analysis of financial ratios in Altman (1968) as well is intended to predict the bankruptcy of the firms, referring to those firms who are legally bankrupt.

For the sake of completeness, we can look at Altman's (1993) classification, which defined four generic terms that help us in better understanding the shades of the terminology: failure, insolvency, bankruptcy, and default. They have different meanings, even though often used interchangeably. Failure has been defined as a persistent lower value of the realized rate of return than the same rate on equivalent investment. Insolvency is the status by which firms are not capable of meeting their current liabilities, and it can be both temporary and chronic. Default can be intended as legal or technical: in technical terms, it refers to a condition in which a debtor company violates conditions of an agreement. It can eventually upgrade in legal form, in case the creditors take legal action against the debtor company. Bankruptcy is the condition in which the company is declared in a court, and thus the final extreme outcome of a failure process.
Thus, bankruptcy is the most preferred definition of failure both in classical studies and in recent twenty-first century studies. (Veganzones et al., 2020)

Balcaen and Ooghe (2006) confirm this inclination, stating that in the vast majority of studies a juridical definition is preferred, such as bankruptcy. The juridical definition is popular because it ensures an objective criterion and a dichotomy that allows to discriminate the sample of firms into separate populations (failing and non-failing firms). In other words, it ensures that the moment of failure is precisely and objectively dated, which is of crucial importance in the statistical analysis.
But they also underline a specific problem related to such juridical definition. As declarations of bankruptcy are mainly based on liquidity and solvency figures and ratios,

the samples for bankruptcy prediction models may contain firms that are declared bankrupted even if they do not show any real sign of failure, in terms of financials figures. To this extent, Hill et al. (1996) refers to "sudden bankruptcy", defined as juridical event that did not demonstrate any symptom of financial distress. Indeed, some companies file for bankruptcy in attempt to get rid of their debts and restart the business, or as a consequence of an external unexpected event (e.g., natural disasters). The juridical definition refers to an ultimate and severe form of failure, which leads to the disappearance of the firm with serious liquidity and solvency problems (Joos et al., 1995). Secondly, bankruptcy prediction models often ignore that it is only one of many possible conclusions of juridical failure processes, such as absorption, merger, liquidation etc.

Finally, these models do not take into account the possible large time lag between the moment when the firm encounters serious financial problems and the moment when the actual juridical bankruptcy is declared: in a few words, the timing of bankruptcy may be much later than the real emergence of failure.

Consequently, samples constructed relying on bankruptcy measures may not be relevant in matter of composition, as not all the firms can be fully evaluated from a financial perspective.

For this reason, a different definition of failure has been considered more effective in creating sample population by several scholars. Indeed, a considerable number of studies rather focus on a criterion of financial distress (Doumpos and Zopoudinis, 1999; Platt and Platt, 2002), which might be based on several indicators like multiple years of negative net operating income, suspension of dividend payments (Platt and Platt, 2002) and many others financial figures considered as reliable predictive signs of insolvency. Doumpos et al. enlarge the scope of such definitions: besides the inability to repay obligations, it is also a situation of negative asset value, which means that total liabilities exceed total assets from the view of accounting. In their study, the ratio of total debts/total assets is considered a global measure of the firms' debt, as it includes both current liabilities and long-term debts.

Therefore, it is not hard to understand that the definition of financial distress is also arbitrary in nature (Keasy and Watson, 1991). The criterion to discriminate between

firms completely relies on the author's concept of financial distress and, most importantly, on his research purpose. Due to its subjectivity, such definition must be used with a careful eye because it may produce biased results (Veganzones et al., 2020). One of the most recent and relevant contributions can be found in Sun et al. (2014), in which they identify two main perspectives – theoretical and empirical - , according to the different objectives of the large number of studies attempting to give a clear definition. This comment helps us to understand that the concept of failure might assume different shapes, depending on the point of view adopted. From the perspective of theoretical analysis, financial distress can have several degrees. It may consist in a dynamic changing between mild financial distress, due to temporary cash flow difficulties, and serious financial distress that may eventually result in bankruptcy. On the other hand, from the perspective of empirical research, there is the necessity to set clear and indisputable criteria for the selection of samples. In such latter perspective, financial distress should be described as a formal situation that unambiguously shows the firm's financial difficulties, such as bankruptcy or arrangement with creditors. According to the authors, future studies should focus on defining a metric to classify the several degrees of corporate financial crisis. To date, studies indeed consider only single criteria of financial distress, rather than the intensity of it.

In view of this, bankruptcy is considered the most appropriate definition of corporate failure, thanks to its objective discrimination criterion from the empirical research point of view (Veganzones et al., 2020).

3.2. Causes and symptoms

Causes, processes and early remedies of failure are very important topics in this field of research. Despite this, very few authors appear to be interested in it. Most of them mainly worked on symptoms of failure, such as financial ratios, and their application for the preemptive detection of bankruptcy.

Most of the papers are interested in the prediction of bankruptcy, but not equally concerned about the prevention of a such terrible outcome. Nevertheless, it would be

much more fruitful for companies in difficulties to know how to avoid the failure (Daubie and Meskens, 2002).

As Luoma and Laitinen (1991) suggested, the failure path can be compared to a human disease. They are often caused by some factors, that lead to the emergence of symptoms, which are observable in the deterioration of financial ratios and eventually result in bankruptcy (the death of the firm). Thus, it is clear that the failure process is not sudden but rather evolutionary in the time. It is always triggered by several specific factors and therefore produces objective symptoms. If these symptoms are detected early, some remedies can be taken on time. We can distinguish two main categories, in attempt to wrap up the different causes of failure identified by the authors that shed light on the theme: external factors and internal factors (Sharma and Mahajan, 1980; Daubie and Meskens, 2002; Carter and Van Auken, 2006; Amankwah-Amoah, 2015). External factors obviously act as uncontrollable factors, beyond the accountability of managers. Environmental conditions like the economic growth rate, the shifting in consumer behaviors and attitudes, and the change in market structure usually influence the performance and the competitiveness of individual firms. (Sharma and Mahajan, 1980; Doumpos and Zopounidis, 1999)

On the other hand, internal factors also play a crucial role. First, the capability of the management to adapt and react to the challenges of external environment is a key factor for business performance. This aspect makes clear that external factors are even more determinant in case of poorly effective management. In addition, bad management always leads to ineffective strategic planification and/or implementation (Sharma and Mahajan, 1980). Moreover, as Kücher et al. (2020) claimed, the internal reasons of failure should be investigated alongside with firms' age, size or life cycle so that the likelihood of suffering that kind of failure can be addressed considering firms' characteristics.

These failures fatally have a deteriorating impact of business performance, resulting in symptoms of financial distress and, consequently, failure. Internal factors appear to be the most relevant cause, as shown in Sharma and Mahajan (1980): 90% of all failures traced by past century's studies are due to inadequate management. Even though this figure regards decades ago, it can be accepted for its relevance.

For the scope of this work, I consider of crucial importance the contributions provided by the authors stating that failure is not a sudden event, but rather a "path" (Luoma and Laitinen, 1991; Laitinen, 1992). The typical starting point is the mix of high financial interest charges, low levels of revenues and poor profitability (Daubie and Meskens, 2002). When business performance is poor and the availability of share capital is limited, firms usually get more indebted, first with long terms and next with short terms. This leads firms to a scarce solvency and thus to liquidity problems. As stated before, we can once again remark that the failure process is dynamic.

Regarding the symptoms of failure, suffice it to say that they can be qualitative and quantitative (typically, financial ratios). Among the most used, we can refer to those considering current assets and liabilities, working capital and total assets, EBIT and total assets, and net interest and total assets. What I have just mentioned come from the selection of the most frequently used financial ratios identified by the literature review of Daubie and Meskens (2002), and a considerable part of them comes from Altman's (1968) pioneer study.

Clearly, the analysis of causes and performance indicators enable managers and researchers to detect in advance business failure. We should remind that the analysis of causes can be subject to errors and biases, as it completely relies on analysts and managers' judgement capability. Looking at symptoms such as performance indicators does not have this limitation, but would not be completely helpful since they do not tell us why failure has occurred. Thus, causes and symptoms should be utilized with a complementary approach, such that the advantage of one will compensate the disadvantages of the other one (Sharma and Mahajan, 1980).

3.3. Business failure prediction methods

Prediction models are the core part of business failure literature and, by far, the most debated field of argument in research. The objective of these models is essentially to separate failed firms from non-failed firms in advance, minimizing the room for errors.

As far as prediction techniques are regarded, we can distinguish the models proposed by literature in three broad categories: (i) statistical methods, (ii) artificial intelligent methods and (iii) ensemble techniques. The former has been the most applied family of methods in the early studies of business failure prediction. It principally includes univariate analysis, linear discriminant analysis (LDA), quadratic discriminant analysis, multivariate discriminant analysis (MDA), logistic regression and factor analysis. The second mainly encompasses - among others - neural networks (NN), decision trees, case-based reasoning, rough sets and soft computing. Kumar and Ravi (2007) indicate that neural networks family is the most applied one, with 25 papers. Thirdly, ensemble techniques involve combinations of statistical and artificial intelligence models, mainly intended to boost the predictive accuracy of models and compare the different performance of the methods combined.

Statistical techniques are considered simple, efficient, and solid. Discriminant analysis is one the first methods utilized for failure prediction - still used today - but Logistic regression (LR) has been used in a far larger number of researches (Veganzones, 2020). Papers based on artificial Intelligence methods have increased a lot in recent years, especially thanks to the development of computing and information technology. Neural Networks are dominant, along with case-based reasoning (CBR) and support vector machines (SVM). Their distinctiveness is that they do not require assumptions, as they focus directly on the elaboration of data, and they are suitable to nonlinear distributions. Their predictive capability is thus more reliable, comparing with statistical techniques which rather try to focus on underlying phenomena. Overall, scholars agree that they perform better than classic statistical methods.

It is both interesting and useful for the comprehension looking at the evolution of failure prediction methods, as described in Veganzones (2020), distinguishing two periods. Artificial intelligence and statistical methods are the most popular models until 2007. After that year, we have an explosive increase of ensemble methods, which indeed overcome both statistical and artificial intelligence models. Considering that a stand-alone classifier can always be added to ensemble methods in order to make the analysis more effective and accurate, scholars have concluded that a correctly ensembled prediction model outperforms any single classifier.

The selection of a corporate failure prediction method is thus arbitrary, as it depends on the researchers' objective (Veganzones, 2020). It is difficult – and beyond the scope of this work - to state the superiority of any of the ones mentioned, as they all have features that make them effective in predicting business failure. In general, ensemble methods and artificial intelligence may be adequate when the goal is predicting corporate failure accurately, as they are not subject to data assumptions. On the other hand, statistical models are more suitable to create classification rules, useful to understand the underlying causes influencing corporate failure's likelihood.

(i) statistical methods

As far as classic statistical models are regarded, Balcaen and Ooghe contributed with the broadest review of statistical prediction techniques, explaining the characteristics of significant predictive methods used in the most relevant studies and highlighting the main related problems.

In the univariate prediction model, an optimal cut-off point is estimated for each selected ratio. A classification procedure is then applied for each measure, based on a firm's value of the ratio and its corresponding optimal cut-off point. Even though it is very simple and straightforward, it is based on the assumption of a linear relationship between all measures and the probability of failure.

Multiple discriminant analysis (MDA) basically consists of a linear combination of variables, that best distinguish between failing and non-failing firms. It is subject to several assumptions, such as the following: the dataset is essentially dichotomous, thus groups are identifiable and non-overlapping; independent variables are multivariate and normally distributed; equal variance-covariance matrices across failing and non-failing firms. Last, it requires a prior probability of failure and costs of misclassification (Balcaen and Ooghe, 2006). We must consider that, although scholars have stressed the importance of these assumptions, most MDA failure prediction models do not take all of them into account, thus they do not ensure that the assumptions are satisfied. For this reason, this method is often applied inappropriately.

It is necessary to recall that the first relevant research work in this field is the one realized by Baever in 1996. This pioneer study proposed two single variables methods: the profile analysis and the univariate discriminant model. With the former, he composed a sample divided in two groups: failed firms and non-failed firms. He found out that the means of the ratios in two groups were significantly different. Indeed, the closer to the year of failure, the wider the gap. Then, he built univariate discriminant models using respectively five financial ratios as independent variables. He finally concluded that the closer the year of failure, the lower the room for errors and the stronger the effectiveness of the model, in terms of predictability.

In 1968, Altman built the famous Z-score: a multivariate discriminant model (MDA) consisting in a multivariate linear function with five financial ratios. He found that the predictive power in the year before failure with this method was better than the single variable discriminant model.

The Logit linear probability model uses the logistic function to transform the dependent variable of financial distress probability into a totally continuous one that is then suitable for linear regression analysis. The first application of logistic regression in financial distress prediction was the research work by Ohlson in 1980, who demonstrated that the LR was more rational for the detection of financial distress.

The Logit Model combines firms' attributes and characteristics into a multivariate probability score, indicating the failure probability. The core concept of this model is that it discriminates firms into failing and non-failing ones based on their logit score and its corresponding cut-off point of the model. Thus, a firm is classified into failing firms when its logit score exceeds the cut-off point and into non-failing firms when its logit score does not exceed the cut-off point. MDA and Logit model are both based on the resemblance principle: firms are assigned to the group they most closely resemble (Balcaen and Ooghe, 2006). But, differently from DMA, Logit model is less "statistical demanding", as it is not subject to prior probabilities of failure nor to assumptions about the distribution of independent variables, but still requires a lack of multicollinearity among the independent variables (Tucker, 1996). However, there is a main assumption underlying the model: the dependent variable is assumed to be dichotomous, with discrete and identifiable groups (failing and non-failing firms). Finally, Logit models

are very sensitive to multicollinearity (Doumpos and Zopoudinis, 1999), since they are often based on financial ratios which are often composed of the same figures from financial statements.

A recent contribution regarding the application of the Logit model is the one of Tseng and Lin (2005). They used a combination of logistic regression and Tanaka's quadratic interval regression model*, which they define "the quadratic interval logit model", applied for the prediction of financial distress of a sample of firms from UK. The results show that this novel model can support the logit model in discriminating between firms that will not be bankrupt, firms that will be bankrupt and firms whose fate in undetermined.

Balcaen and Ooghe (2006) provided an exhaustive contribution regarding the problems and limitations of the classic statistical methods of business failure prediction. First, they defined the problems related to the classical paradigm, according to which "given a set of firms with known descriptor variables and known outcome class membership, a rule is constructed which allows other companies to be assigned to an outcome class on the basis of their descriptor variables" (Hand, 2004). According to the authors, such paradigm fails to take account of some relevant aspects of failure prediction. In addition to the arbitrary definition of failure - which has already been discussed in the above paragraphs of this chapter - they refer to the non-stationarity and data instability problem. In fact, the classical paradigm assumes the stationarity of the distributions of the variables. This means that the relationships between independent and dependent variables are assumed stable over time, as well as the inter-correlations between the independent variables (Zavgren, 1983).

On the contrary, several scholars have proved evidence of data instability and non-stationarity (Barnes, 1982; Richardson and Davidson, 1984; Zmijewski, 1984). Mensah (1984) observed that these conditions may induce negative consequences for the classic statistical models of failure prediction, since the accuracy and structure of such models may differ when applied in different economic environments. The negative impact on accuracy can be reduced if the models are re-estimated and updated over time.

Another range of problems underlined by Balcaen and Ooghe is sample selectivity, concerning the assumption that a random sample design is used in the classical

paradigm. Actually, the majority of classic failure prediction models relies on non-random samples of firms, as the case of many of paper I have cited so far (Altman, 1968; Deakin, 1972; Altman et al., 1997; Ohlson, 1980; Zavgren, 1983).

Non-random samples may be the results of several choices of sampling criteria by scholars, just like state-based samples and "complete data" samples. In this case, due to non-random sampling criteria, we can expect that the estimates are biased (Zmijewski, 1984).

To sum-up, we can state that statistical corporate failure prediction models are often subject to over-modeling (Balcaen and Ooghe, 2006), meaning that the model selected is often forcefully adapted to scope of research. This implies that the results of classic statistical methods can eventually be biased and sample-specific.

(ii) artificial intelligence methods

Artificial intelligence methods began to be used for the prediction of business failure because of successful progresses of software and artificial intelligence technology. The most common techniques are Neural Networks (NN), Rough Sets (RS), Case based reasoning (CBR), and support vector machine (SVM). The main advantage of such family of methods is undoubtedly that they are not subject to the typical assumptions mentioned above for statistical methods, as they mainly rely on the analysis and elaboration of large quantities of data, and the mining of knowledge from training samples.

Neural Networks began to be applied in this field of research in the early 1990s. Such models basically consist of an interconnected group of artificial neurons and apply a connectionist approach to the elaboration and computation of data (Vengazones, 2020). Many comparisons between NN, MDA and logit regression have been made, especially regarding the performance and the accuracy of the predictions. Most researchers indeed proved that NN models generally overperform the statistical methods. One of the pioneer studies in such topic is Fletcher and Goss (1993), who bridged the gap between classic statistical methods and neural networking. They applied Back Propagation Neural Networks BPNN for the prediction of bankruptcy on a sample of 36 firms and developed a model using three financial ratios. They also compared the accuracy of the results with the Logit regression and thus demonstrated that BPNN is more statistically

efficient and more accurate in terms of forecasts (better predictability, less variance in the errors and lower prediction risk), even though required a significant effort in building the model.

Zhang et al. (1999) also confirms that NN models' performance is significantly better when compared to logistic regression models. The accuracy of their NN model is 80.46% versus 78.18% of logistic regression models, for small test set; but the gap increases up to 86.64% versus 78.65% for large tests set, suggesting that the performance and robustness of the NN model are much better in large test set.

In fact, we might consider as a downside that NN models require a significantly higher amount of data, compared to pure statistical techniques. Moreover, it is criticized because of its complexity of understanding in decision making by managers, due to its intricate network structures. However, some scholars have tried to fill this gap, just like Baesens et al. (2003), who provided explanatory rules and decision tables to make consultations and decision-making easier for practitioners and managers.

Support vector machine (SVM) is another important artificial intelligence method, proved to be powerful data classification and function estimation tool (Wang et al., 2015). It is relatively new and based on the structural risk minimization principle, rather than the empirical risk minimization principle. Shin et al. (2005) used this method to address the problem of corporate failure prediction of South Korean companies, and their main findings show an overall better accuracy and performance of this method in comparison with BPNN, which significantly increases when the training set size gets smaller.

On the other hand, Bose and Pal (2006) analyzes financial statements data of several click-and-mortar companies, in attempt to predict their financial fate using DA (discriminant analysis), NN and SVM. They concluded that NN generally provided better results in terms of accuracy, even though the best performance is given by a hybrid model using DA for the initial selection of financial ratios and NN for the analysis and classification (77.5% of accuracy).

However, a great number of studies used SVM in combinations with other techniques rather than using it as a single classifier, preferring hybrid or ensemble models, as discussed further in this review.

Case Based Reasoning (CBR) is based on K-nearest neighbor algorithm attempting to forecast the outcome of current cases on the basis of the outcomes of past analogue cases. Jo and Han (1996) developed a system consisting of three subprocesses: defining key attributes in the identification of similar cases to set the target variables; catching similarity and retrieving analogous cases; generating forecasts through combining similar cases selected. Moreover, they developed an integrated model combining discriminant analysis, NN and CBR, concluding that the performance of the combined model itself is much better than any of the three independent methods, taken as stand-alone. There is no significant difference among the three techniques, even though using CBR becomes more effective when data are not sufficient. In conclusion, scholars agree that its real advantage is the ease of understanding and a relatively high accuracy (Sun, 2014).

Finally, Dimitras et a. (1999) applied rough sets theory (RS) as a decisional tool for the prediction of failure of Greek companies. This method comes from computer science and is applied in many fields of research. In business failure prediction, it has been used by several scholars (Bioch et al., 2001; Dimitras et al., 1999; McKee, 2000). It basically consists of a pair of sets made of lower and upper approximations of an original set. In business failure prediction, it provides the advantages of - among others - understandable decision rules, case support and both quantitative and qualitative variables (McKee, 2000; Sun, 2014). Dimitras (1999) stated that RS represents a suitable method for the prediction of business failure. The decision rules derived from the model highlight the key relevant attributes that should be taken in account to evaluate the risk of failure. In particular, this study underlines the effectiveness of financial profitability, liquidity, debt capacity and working capital ratios as predictive indicators. Good results were also guaranteed with respect to classification, defined as “generally better” than those obtained with discriminant analysis and logit regression. Other key advantages indicated by the authors are the tendency to discover facts hidden in data, the minimization of time and costs in decision making activities, and the transparency of classification decisions.

McKee (2000) developed a prediction model with RS, designing a sample of 100 companies (one half healthy, one half bankrupted), supported by another sample of 100

companies to validate the model. He demonstrated that his model was up to 88% accurate in terms of predictive ability, and remarks the advantages of high effectiveness and easy interpretation for bankruptcy prediction.

In general, we can conclude that artificial intelligence methods achieve better performance levels than classic statistical methods, in terms of accuracy (Lin, 2009; Tseng and Hu, 2010), even though the overall benefits are only slightly superior.

(iii) ensemble methods

In recent years, ensemble methods became a central topic in business failure prediction topic. They are based on the exploitation of several single classifiers for data analysis and forecast and are expected to generate a smaller error variance than each single classifier as a stand-alone.

As remarked by Veganzones, starting from 2007 ensemble methods' utilization grew exponentially and gained a primary importance, especially compared to statistical methods, which basically remains important to compare results among different methods (du Jardin, 2015).

A key contribution comes from Chandra et al. (2009), who developed and applied an ensemble model to predict the failure of dotcom companies. They created a system comprising - among others - Logistic regression, Support Vector Machine (SVM) and Neural networks (NN) and collected a database consisting in 240 dotcom companies (120 failed, 120 non-failed). This study reports an accuracy level far better than other studies on the same dataset.

An example of this category is Chuang (2013), who developed a CBR-based hybrid model for the prediction of corporate failure, consisting of three different combinations of the CBR method with other single classifiers: Rough Sets – CBR; Classification and Regression Tree – CBR; Rough Sets – Grey Relational Analysis – CBR. They state that the need of integrating CBR with other classification and diagnosis methods is due to the reduced accuracy and effectiveness when CBR is applied alone. The combination of RS – GRA – CBR appears to outperform the other models in terms of accuracy.

In such a diversified context, the Italian CNDCEC has decided to rely both on the effectiveness in forecasting and the ease of utilization, for the selection of a business failure prediction method. For such reasons, they excluded the range of models of artificial intelligence, as they would require an amount of competencies and resources that is not justified by their superior performance in terms of accuracy and understandability. More precisely, the chosen technique is to be considered a multivariate model and thus derives from the classic statistical methods framework.

4. Empirical analysis

4.1. Research Methodology

The objective of the following analysis is to test the effectiveness of the alerting Indicators introduced by the Reform, with a retrospective approach. The analysis has been carried with a panel data logistic regression model, applied on a set of companies selected from the industries I have already mentioned before: wholesale and retail trade (ATECO 2007: G45, G46, G47) and food and restaurant services (ATECO 2007: I56). The regression is intended to highlight the relationship between the existence of the state of alert - defined as a condition of negative Net Worth, or the simultaneous exceedances of the five industry-specific Indicators - and the actual emerging of the state of crisis in at least one of the following years.

4.2. Data collection

The panel data has been developed with data extracted by Aida database, which contains economic and financial data of listed and non-listed Italian companies. First, I have created six new customized financial Indicators, consisting in the computation of the Negative Net Equity and the five alerting Indicators identified by the CNDCEC (National Council of Accounting Experts) presented in Chapter 2. Needless to say, the Indicators have been developed according to the formulations as showed in the document of presentation issued by the CNDCEC. More precisely, this is how every single indicator has been composed, combining financial statement figures. In brackets, you can see the code attached to the corresponding financial figure on Aida database:

- The negative shareholders' equity index was obtained by subtracting from total shareholders' equity (1084) amounts due from shareholders for payments still due (1001) and the reserve for transactions to cover expected cash flows (1210). The CNDCEC also specifies that any resolved dividends not yet accounted for are subtracted from total shareholders' equity. However, this item has not been included in the calculation, as it can only be identified after a careful reading of the explanatory notes.

- the sustainability of financial expense ratio was calculated by comparing total financial expense (1159) with revenues from sales and services (1124);

- the capital adequacy index was obtained by placing the difference between total shareholders' equity (1084) and amounts due from shareholders for payments still due (1001) on the numerator and placing total payables (1118), regardless of their nature, plus accrued expenses and deferred income (1119) on the denominator. With respect to the numerator, the Board indicates that any resolved dividends not yet accounted for should also be subtracted from total shareholders' equity, which have not been taken into account for the reason given above;

- the cash flow index has been obtained by comparing the cash flow to total assets in the balance sheet (1074). Cash flow is the sum of net income for the period and non-cash costs (e.g. amortization and depreciation, impairment of receivables, provisions for risks), from which non-cash revenues (e.g. revaluations of equity investments, deferred tax assets) are deducted. Cash flow is equivalent to the algebraic sum of the following items: net income for the year (1179), total amortization and depreciation (1144), provisions for risks (1146), other provisions (1147), total write-downs (1169), deferred tax assets (1236) and total revaluations (1165).

- the liquidity ratio was calculated by dividing the sum of current assets (1071) and accrued income and prepaid expenses (1072) with the sum of short-term debt (1116) and accrued expenses and deferred income (1119);

- the social security and tax debt ratio was obtained by placing the sum of amounts due to tax authorities within and beyond the year (3110 and 3111) and amounts due to social security institutions within and beyond the year (3112 and 3113) at the numerator and placing total balance sheet assets (1074) at the denominator.

As stated earlier, the time frame considered spans from 2010 to 2019. For each year of observation, companies have been extracted according to a research strategy intended to precisely narrow the population into coherent bounds and manageable

size. Thus, ten data extractions have been performed, one for each of the years in the time frame. The research strategy utilized is the following:

- Companies belonging to ATECO 207 codes G45 (wholesale and retail trade and repair of motor vehicles and motorcycles), G46 (wholesale trade, excluding motor vehicles and motorcycles), G47 (retail trade, excluding motor vehicles and motorcycles), I56 (food service activities)
- Non listed companies
- Financial statements published in the fiscal year of observation
- Total assets greater than, or equal to, € 4,400,000.
- Net Revenues greater than, or equal to, € 8,800,000.
- At least 50 employees
- Companies for which it is possible to estimate the *index of sustainability of financial charges*
- Companies for which it is possible to estimate the *capital adequacy index*
- Companies for which it is possible to estimate the *index of liquid return on assets*
- Companies for which it is possible to estimate the *liquidity index*
- Companies for which it is possible to estimate the *pension and tax debt ratio*.

In every year of the time frame, several anagraphic and financial data have been extracted for each company. In particular: company name, tax code, Ateco 2007 code, region of the registered office with relative ISTAT codes, year of constitution, legal status, eventual default procedures and corresponding starting and closing date of the procedures, total assets, net result. Obviously, in addition to this information, I have collected the values of the six early warning Indicators explained above for each company, in each year of observation. As you will see further in the explanation of the statistical model, six dummy variables have been computed, each one corresponding with one of the default risk Indicators. With respect to the "Negative Net Equity", the dummy variable is 1 when Net Equity is indeed negative, otherwise 0. When it comes to the five industry specific Indicators, the dummy variables are equal to 1, when the alerting threshold is exceeded (in a single year of observation), or equal to 0 when the threshold is not exceeded.

We will see in details the explanation of the final variables in the next paragraph. At the moment, it suffices to remember that the CNDCEC has assigned different thresholds to ATECO 2007 code G47 and I56, compared to G45 and G46. Of course, this has been taken into account in the development of the panel data.

4.3 Methods of analysis

A few further passages have been performed to obtain the final panel data. First, companies who have published less than three financial statements in the time frame I considered (2010-2019) have been excluded by the sample. Furthermore, some companies have changed their ATECO 2007 Code over the years, shifting to different categories than those included in the scope of the research. For simplicity, they have been considered as having the same ATECO 2007 Code they used to have. Nevertheless, this has occurred only for few units of firms. Similarly, eight companies have been excluded due to the missing values with respect to some financial figures in the statements.
All the data collected as showed above have been organized in a spreadsheet panel on Excel.

The empirical analysis has been performed on a sub-sample of the population, comprehending all the companies that encountered a crisis in at least one fiscal year in the period of observation, whose variables have been combined in a panel logistic regression:

$$Y_{XT} = a + \beta_{1,T}X1 + \beta_{2,T}X2 + \beta_{n,T}Xn$$

Where:
Y= lag1, lag2 = dichotomous variable that indicates whether the company went into crisis
B1, B2,…Bn = slope coefficients
X1, X2,…Xn = explanatory variables.

4.4. Explanation of the variables

The model combines eight explanatory variables and two dependent variables.
The dependent variables are those indicating the occurrence of the business crisis in the following year of statement publishment (lag1), and in the second following year of statement publishment (lag2), with respect to the year of observation. For the former (lag1), the period of observation has been clearly reduced to 2010-2018, since companies observed in 2019 would eventually go into crisis in 2020, but our time frame of observation goes from 2010 to 2019. For the latter (lag2), due to the same reason, the period of observation has been further reduced to 2010-2017.

An important point to clarify is that, in this analysis, the legal definition of business crisis has been adopted, i.e. voluntary procedures have not been taken into consideration for the determination of the status of crisis (e.g., voluntary liquidation, dissolution, voluntary closure of the company, etc.) In the model, the company is considered into crisis *only* when any of these events occurred:

(i) Bankrupt (e.g. *Fallimento*)
(ii) Arrangements with creditors (e.g. *Concordato preventivo*)
(iii) Debt restructuring agreement (e.g., *Accordo di ristrutturazione dei debiti*).

The variables included in the regression model are the following:

Lag1: dependent dichotomous variables which takes value 1, if the company has gone into crisis during the following fiscal year in which financial statements have been published, otherwise 0. I have considered a company to be into crisis when any of these events occurred: legal bankrupt; arrangements with creditors (e.g. Concordato preventivo); debt restructuring agreement (e.g., accord di ristrutturazione dei debiti).

Lag2: dependent dichotomous variables which takes value 1, if the company has gone into crisis during the *second* following fiscal year in which financial statements have been published, otherwise 0. I have considered a company to be into crisis when any of

these events occurred: legal bankrupt; arrangements with creditors (e.g. Concordato preventivo); debt restructuring agreement (e.g., accord di ristrutturazione dei debiti).

ALLERTA: dichotomous variable which takes values 1, if the company is considered on alert status. You should remember that companies are considered on alert status whether they have: (i) Negative net equity; (ii) joint exceedance of the alerting thresholds in the five industry specific Indicators; (iii) both negative net equity and joint exceedance of the five Indicators. Thus, this variable depends on the dummy variables related to the Negative Net Equity and the five alerting Indicators of the Code, as introduced earlier in the "Data collection" paragraph.

TOT_ASS: it indicates the logarithmic value of total assets of the company. It acts as a measure of the size of the firm.

DUMMY_CE: dichotomous variable which takes value 1, if the company is in one of the regions of central Italy, according to the ISTAT regional codes: 09 (Tuscany), 10 (Umbria), 11 (Marche), 12 (Lazio); otherwise, 0

DUMMY_SO: dichotomous variable which takes value 1, if the company is located in one of the regions of southern Italy, according to the ISTAT regional codes: 13 (Abruzzo), 14 (Molise), 15 (Campania), 16 (Puglia), 17 (Basilicata), 18 (Calabria), 19 (Sicily), 20 (Sardinia); otherwise, 0.

AGE: variable which indicates the age of the company, calculated as the difference between the year of observation and the year of establishment.

MISSING_FS: dichotomous variable which takes value 1 if the company has at least one missing financial statement between the first and the last ones available in the time frame of observation.

SPOS: dichotomous variable indicating that the financial statement has arguably been manipulated. It takes value 1 if the ratio between net profit and total assets is comprised between 0 and 2.5%.

CRISIS_INT: variable indicating the intensity of the crisis, compounded as ratio between Loss and Net Equity.

5. Empirical Results

This section discusses the following: (a) descriptive analysis, (b) pairwise correlation between alert and crisis in the following year (LAG1) of financial statement publishment, or in the second following year (LAG2) of financial statement publishment; (c) correlation between the activation of the five Indicators and Negative Net Equity; (d) principal correlations among all the variables included in the regression model; (e) random-effects logistic regression model with Lag1 as dependent variable (crisis in the first following year); (f) random-effects logistic regression model with Lag2 as dependent variable (crisis in the second following year)

(a) Descriptive analysis

An important initial step in discussing results is the identification of most relevant descriptive statistics of the population and the subsample of analysis. With respect to the whole population, the year in with the largest number of observations is 2013, whereas 2019 presents the lowest number. It can be useful to notice that, on average, 5% of observed companies goes into alert in one year of observation. The highest percentage occurs in 2013, 2015 and 2018, with an overall 6% of companies signaled. With respect to the exceedance of the five Indicators, only 1% of companies on average simultaneously surpass the five alerting thresholds.

As far as the subsample of analysis is concerned, which consists of all the companies of the population that go into crisis in at least one of the years of observation, 2012 and 2017 are the periods with the greatest number of crisis in the first following year,

resulting in 22% of firms going into a crisis in the following year. The lowest value is in 2010, with only 3% of companies incurring in a crisis in the following year of publishment.

As we go deep in the analysis, 77% of companies revealed a Negative Net Equity in 2019, representing by far the highest value in the period of observation, considering that the average figure is 40% per year. On the other hand, the year with the lowest cases of Negative Net Equity is 2010, with only 6%. These evidences confirm the negative trend underlined by Cerved in Chapter 2, with respect to the patterns of business failure and insolvency in the Italian economic environment in the last decade.

If we consider the number of times of the joint exceedance of the five Indicators, 2013 is the peak year, with 20% of companies (65) that overcome the alerting thresholds, well above the average of 12%.

However, the most relevant characteristics emerging from this analysis are the following: first, in every year of observation, there is an extremely high percentage of overlaps between the activation of Negative Net Equity and the activation of the five industry specific Indicators (on average, 93% of overlaps). This information is of crucial importance, because it is a hint that most of the companies going into alert would likely not even calculate the five Indicators. Indeed, you should remember that the status is of alert is signaled when a Negative Net Equity is confirmed, and thus the five Indicators are not even considered.

Secondly, many companies signaled by the system as in status of alert do not actually go into crisis in the following year. On average, 52% of companies in alert in a certain year of observation do not go into crisis in the following year of publishment of financial statements.

(b) Pairwise correlation between alert and crisis in the following year (LAG1) of financial statement publishment, or in the second following year (LAG2) of financial statement publishment

Table 1 refers to the pairwise correlation between the existence of an alerting status, defined by the variable ALLERTA (negative net equity or joint exceedance of the five Indicators) and the status of crisis, compounded through the Pearson correlation coefficient. It clearly shows a small positive correlation (0.147) between the status of alert and the emergence of crisis in the following year of financial statement publishment (Lag1). The correlation is also significant, indicating that the alerting system defined by the CNDCEC seems to be effective in detecting a crisis in the short-term. Nevertheless, the results also show a negative and significant correlation (-0.136) between the activation of the alerting Indicators (ALLERTA) and the eventual occurrence of crisis events in the second following year of financial statement publishment (Lag2). Thus, companies do not go into crisis into the second year of operation (Lag2) because they supposedly did it in the previous year (Lag1). To sum up, in presence of both a positive and significant correlation between the status of alert and the crisis in the first following year (Lag1), and a negative correlation between the status of alert and the crisis in the *second* following year (Lag2), it is reasonable to expect that the alerting system is predictive of a crisis in the short term.

Table 1. Correlation between alert and crisis in the following year of financial statement publishment

Pairwise correlations

Variables	(1)	(2)	(3)
(1) ALLERTA	1.000		
(2) lag1	0.147*	1.000	
	0.000		
(3) lag2	-0.136*	-0.164*	1.000
	0.000	0.000	

* shows significance at the .05 level

(c) Pairwise correlation between the exceedance of the five indicators and Negative Net Equity

In Table 2, we can see that there is a strong and significant positive correlation between the Negative Net Equity (NEG_EQUITY) and the activation of the alerting Indicators (WARNING_5), equal to 0.442. This relationship is extremely relevant for the evaluation of the effectiveness of the five alerting Indicators introduced by the Code. The results in Table 2 highlight a relevant overlap between the signaling functions of Negative Net Equity and the Indicators. This insight is also evident from the descriptive analysis, where we have already noted the high percentages of overlaps between Negative Net Equity and the joint activation of the Indicators. The predictive capability of the alerting Indicators is thus reduced by this evidence, because in practice they are not calculated when the Net Equity is negative. From descriptive analysis, we should recall that in the subsample of analysis there is a significantly small number of companies in status of alert due to the activation of the five Indicators.

Table 2 Pairwise correlation between the exceedance of the five indicators and Negative Net Equity

Pairwise correlations

Variables	(1)	(2)
(1) WARNING_5	1.000	
(2) NEG_EQUITY	0.442* 0.000	1.000

* shows significance at the .05 level

(d) Principal correlations among all the variables included in the regression model

Table 3 presents the correlations among all the variables utilized in the analysis, which allows us to enlarge the scope of the analysis. First, there is a negative correlation between the status of alert (ALLERTA) and total assets (TOT_ASS), which is also significant. This result suggests that the companies signaled by the alerting system are primarily those with lowest total assets, which might be considered as a benchmark of company size. This figure seems to confirm the doubts expressed in Chapter 2, regarding the selection methods of the alerting thresholds used by the CNDCEC.
It is worth noting a positive correlation between the age (AGE) of companies and the emerging of the alert (ALLERTA), which means that companies going into alert are mainly those with an older age. These two results are very crucial for the critical evaluation of the whole system.

Finally, another significant result that emerged from the analysis is a substantial negative correlation between the variable SPOS and the emerging of the status of alert (ALLERTA). As anticipated, the variable SPOS (Small positive earnings) is used to signal that the financial statements have probably been manipulated. The negative correlation is likely related to the fact that companies in alert are usually loss-making, rather than profit.

Table 3. Principal correlations among all the variables included in the regression model

Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(1
(1) lag1	1.000									
(2) lag2	-0.164*	1.000								
(3) ALLERTA	0.147*	-0.136*	1.000							
(4) TOT_ASS	0.038	0.117*	**-0.248***	1.000						
(5) DUMMY_CE	0.020	0.015	0.029	0.092*	1.000					
(6) DUMMY_SO	0.018	0.019	-0.079*	-0.117*	-0.273*	1.000				
(7) AGE	-0.007	-0.033	**0.191***	0.146*	-0.035	-0.224*	1.000			
(8) MISSING_FS	-0.004	-0.015	0.051*	-0.057*	-0.011	0.014	-0.014	1.000		
(9) SPOS	-0.112*	0.034	**-0.438***	0.060*	-0.025	0.090*	-0.143*	-0.019	1.000	
(10) CRISIS_INT	0.029	0.037	0.099*	0.000	0.019	-0.028	0.021	-0.007	0.013	1.

* shows significance at the .05 level

e) random-effects logistic regression model with Lag1 as dependent variable (crisis in the first following year)

The results of the first regression model, considering Lag1 as the dependent variable (recall that it takes value 1 when the company goes into crisis in the first following year of publishment of financial statements), are presented in Table 4. The explanatory variable corresponding to the status of alert (ALLERTA) positively influences (0.836) the emerging of a crisis in the following year of publication of the financial statement (Lag1), and it is also very significant ($p < 0.01$). This evidence confirms what emerged from the positive correlation presented above, in Table 1, and proves that the alerting system has an effective predictive capability in the short term, from a statistical perspective. Furthermore, the company size (TOT_ASS) has a substantial positive influence (0.470) on the crisis in the following year (Lag1). As this influence is also very significative, we can state that the dimension of a firm is likely to influence the

probability of the emerging of a crisis in the following year. Comparing this with the negative correlation between ALLERTA and TOT_ASS in Table 3, we can reasonably observe that being a small company can result in a higher probability of going into alert and then crisis.

With respect to the geographic variables, it results that the variable referred to companies from central Italy (DUMMY_CENTRE) has a small positive influence (0.098) on the crisis in the first following year, but it is not significative from a statistical perspective. On the other hand, coming from southern Italy (DUMMY¬_SOUTH) seems to have a significant impact (0.264) on the occurrence of the crisis in the first following year (Lag1), and it is also significant ($p < 0.1$).

When it comes to the age of firms (AGE) included in the model, there is a small but significant negative influence (-0.008) on the dependent variable (Lag1), even though the coefficient is very small. The negative influence of the variable MISSING_FS, referring to companies having at least one missing financial statement in the time frame of observation, is not significant in the model. Moreover, the variable SPOS (small positive earnings), acting as a signal of likely manipulation of financial statements, presents a negative influence on the emersion of the crisis in the following year (Lag1) and is also very significant ($p < 0.01$). It is not surprising that companies having small positive earnings are very unlikely to go into crisis, unlike companies presenting negative earnings.
Finally, the positive influence of crisis intensity (CRISIS_INT) is not significant.

Table 4. Random-effects logistic regression model with Lag1 as dependent variable (crisis in the first following year)

Random-effects logistic regression

lag1	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ALLERTA	0.836	0.136	6.14	0.000	0.569	1.103	***
TOT_ASS	0.470	0.115	4.07	0.000	0.244	0.697	***
DUMMY_CENTRE	0.098	0.147	0.67	0.504	-0.189	0.385	
DUMMY_SOUTH	0.264	0.145	1.82	0.069	-0.020	0.548	*
AGE	-0.008	0.004	-2.07	0.038	-0.015	0.000	**
MISSING_FS	-0.107	0.274	-0.39	0.697	-0.644	0.430	
SPOS	-0.456	0.157	-2.89	0.004	-0.764	-0.147	***
CRISIS_INT	0.003	0.005	0.57	0.568	-0.008	0.014	
Constant	-3.790	0.516	-7.34	0.000	-4.802	-2.778	***

Mean dependent var	0.155	SD dependent var	0.362
Number of obs	2414.000	Chi-square	79.065
Prob > chi2	0.000	Akaike crit. (AIC)	2018.433

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

f) random-effects logistic regression model with Lag2 as dependent variable (crisis in the second following year)

Table 5 shows the results of the regression model with Lag2 as dependent variable, indicating the emerging of crisis in the second following year of publishment of financial statements. It is worth noting a significant negative influence (-0.733) of the status of alert (ALLERTA) on the occurrence of crisis, which also very significant ($p < 0.01$). This evidence as well seems to confirm what we already noticed when observing the pairwise correlations between the same two variables: the status of alert is arguably effective in predicting the crisis only in the short term (first year).

Table 5. Random-effects logistic regression model with Lag2 as dependent variable (crisis in the second following year)

Random-effects logistic regression

lag2	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ALLERTA	-0.733	0.156	-4.70	0.000	-1.038	-0.427	***
TOT_ASS	0.471	0.117	4.04	0.000	0.242	0.700	***
DUMMY_CENTRE	0.086	0.148	0.58	0.560	-0.203	0.376	
DUMMY_SOUTH	0.156	0.145	1.07	0.284	-0.129	0.441	
AGE	-0.003	0.004	-0.89	0.373	-0.011	0.004	
MISSING_FS	-0.058	0.289	-0.20	0.840	-0.625	0.508	
SPOS	-0.195	0.131	-1.49	0.137	-0.452	0.062	
CRISIS_INT	0.017	0.012	1.46	0.144	-0.006	0.041	
Constant	-3.326	0.516	-6.45	0.000	-4.337	-2.315	***

Mean dependent var	0.164	SD dependent var	0.370
Number of obs	2273.000	Chi-square	52.948
Prob > chi2	0.000	Akaike crit. (AIC)	1985.485

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

6. Discussion and Conclusion

The analysis was intended to assess the predictive capability of the alerting system, introduced by the new Italian Code of business crisis and insolvency, of detecting the occurrence of a crisis in at least one of the years of observation. The layout and functioning of the alerting system has been presented in section 2.5.

The study demonstrates a well-defined correlation between the existence of the status of alert and the emergence of a business crisis in the following year of publishment of financial statements.
This evidence suggests that the alerting system is indeed effective in predicting a crisis, with respect to a short-term perspective. The regression model indeed shows that the status of alert positively influences the emerging of a crisis in the first following year, whereas negatively impacts on the emerging of a crisis in the second following year. Despite this, the data makes us doubt with respect to the real effectiveness of the system in helping companies in acting promptly to avoid a crisis and related consequences. Considering the usual timings of preparation, approval and publishment of financial statements, there is very little room for corrective actions when the activation of the alert occurs. In view of this, it is likely that the thresholds of the Indicators and the choice of the Negative Net Equity are so much close to the crisis, that companies in status of alert are clearly already irremediable. It is natural to wonder whether the benefits of the concretely outweighs costs, in view of the numerous and complex procedures, requirements, obligations, and involved parties. Steadily and rigorously monitoring financial figures that would make the alert on is objectively costly, also considering that it requires appropriate organizational and administrative resources and capabilities. Not all the companies have the internal efficiencies required by the new Reform: many of them should outsource advising and reporting activities, with an evident negative impact on their financial performance.

But the most relevant problem emerging from the analysis derives from the high positive correlation between the presence of a Negative Net Equity and the exceedance of the five industry specific Indicators. The descriptive analysis shows an average rate of

overlap equal to 93%, in subsample of analysis. In practice, the great majority of the activations of the alert is due to the condition of Negative Net Equity, which make the computation of the five industry specific Indicators avoidable and unnecessary (recall that when Net Equity is negative, the alert is on. There is no need for the five Indicators). This evidence has a straightforward consequence, with respect to the role and effectiveness of the five alerting Indicators: most of the companies in alert do not even calculate the five Indicators. Indeed, what emerges from the descriptive analysis is that a very small number of companies go into alert as a consequence of the activation of the five Indicators, compared to those signaled by Negative Net Equity.
In addition, if we match this latter implication with the former regarding the effectiveness of the system in the short-term, we can conclude that the five Indicators would rarely be "on", thus signaling the status of crisis. Furthermore, when they are on, it is too late for companies to recover.

To sum up, the Indicators formally have a predictive capability in predicting a crisis, but this capability is in practice reduced by the strong overlap with the presence of Negative Net Equity, which make them unlike to be computed.
Again, these implications make legitimate to question about the impact of the new system on the whole economic environment, in view of the unsubstantial benefits that it provides.

The negative correlation between the status of alert and total assets suggests that small sized companies are more prone to go into alert, whereas there is a small positive correlation between the age of firms and the activation of the alert, indicating that older companies seem more likely to be signaled. In addition, the regression shows that the dimension of companies has a positive influence on the occurrence of a business crisis in the first following year, confirming that firms size can act as a determinant in view of a possible crisis. Therefore, the data shows that the system of Indicators, as it is today, does not take in consideration the diversities within the industries, in terms of age and dimensions. The CNDCEC openly states that the identification of the critical alerting thresholds of all the Indicators is based on the median value of a subsample of insolvent firms, subsequently adapted to the industrial segmentation. No element of

discrimination regarding dimensions and age has been considered, confirming my doubts in Chapter 2. But it is indisputable that small-size firms are more vulnerable in terms of financial structure, and this characteristic should had been taken into account when setting the critical thresholds of the industry specific alerting Indicators.
In addition, it is worth to say that the analysis has demonstrated a positive and significant influence of the variable DUMMY_SOUTH, indicating companies from southern Italy, on the emerging of a crisis in the first following year of publishment of financial statements, suggesting that being a company from the South can result in a higher probability of incurring in a crisis.

In summary, this research work has shed light on some potential limitations arising from the new system of Indicators introduced in Italy by the Code of business crisis and insolvency. According to the empirical analysis, the alerting system demonstrated its capacity in predicting a crisis in the following year, thus proving to be effective in the very short term. Nevertheless, the costs generated by the whole complex of obligations, requirements and structural adjustments seem not to overweigh the actual benefits provided by the system. Indeed, the alerting Indicators signal a small number of companies in the year of observation, and they typically do it when the condition of financial distress appears already irreversible. Signaled firms in financial distress are too close to the crisis, and usually incur in a default procedure within the following year. My question here is therefore: do the expected benefits of the alerting system significantly justify the corresponding costs? How much does the alerting system weighs on both individual firms and the whole Italian economic environment, in terms of efforts and costs?

SUMMARY

Introduction

With the issuing of the legislative decree n. 14 on 12th January 2020, the new Italian Code of business default and crisis (Codice della crisi di impresa e dell'insolvenza) was introduced, with the intent to reform insolvency proceedings and regulate alerting and crisis settlement practices. The new regulation is aligned with supranational recommendations, which set the guidelines for a new approach to business failure and insolvency, with the objective "to ensure that viable enterprises in financial difficulties […] have access to national insolvency frameworks which enable them to restructure at an early stage with a view to preventing their insolvency, and therefore maximize the total value to creditors, employees, owners and the economy as a whole." (European Commission Recommendation, 12th March 2014)".

Indeed, the reform of 2019 is intended to bring out an "early diagnosis" of the state of insolvency of the enterprise before the situation becomes irreversible in terms of business continuity.
The main rational of the new framework is powered by the goals and objectives set by international and supranational standards, as I will explain during the dissertation, stating that the regulatory structure of the business crisis and failure should aim at safeguarding the residual value of the enterprises, rather than dispel such value for purposes of asset liquidation. This latter perspective must be overcome, because it is in practice outdated and tremendously ineffective in delivering the ultimate objective of bankruptcy and insolvency laws, that is to protect the whole financial and economic system.

For this purpose, the new legislation introduces a completely renewed regulatory framework, which can also be viewed as disruptive, in light of all the marked differences with respect to the old context.
The new regulation is primarily intended to introduce a preemptive phase of individuation of a state of alert, thus in favor of the emerging of distress symptoms, aimed to allow a prompt analysis of the causes of the economic and financial troubles

of the enterprise. A second consequent objective is to encourage an assisted crisis resolution process, functional to the negotiations for reaching an agreement with the creditors, or possibly with only some of them.

The outcome of these underling motivations and purposes is the introduction of an alerting system based on the activation of a set of "alerting indicators". Namely, they indicate imbalances in terms of profitability, capital structure and financial requirements, with respect to specific characteristics of the business. In a few words, the system has been created with the intention to act as a reliable symptom of a likely imminent state of crisis and insolvency of the enterprise.

The motivation for this research work is mainly due to the relevance of the new regulation. The completely new layout and functioning introduced with the Reform represents a breakthrough innovation, in attempt to broadly renovate the Italian bankruptcy framework. The key element is the shift from an outdate punitive attitude - aimed at eliminating insolvent firms from the market - to a new approach finalized at first identifying and then rescuing insolvent firms, acting promptly to avoid business failures and preserve the common interest of business continuity.
In a few words, the objective of this research work is essentially to analyze and test the effectiveness of such predictive instruments in preemptively detecting the occurrence of a crisis or insolvency state, adopting a retrospective approach on the observation of an extensive set of Italian companies. But stating that highlighting such effectiveness is the ultimate goal of this whole research work would not reflect the true contributions of this study. More precisely, we want not only to test the predictive ability of such indicators, but also to understand and balance pros and cons of the whole system, in attempt to obtain a clear view of its implications and make some reliable expectations on the outcomes that the introduction of the Reform will be producing.
The compliance of the new Code of business crisis and insolvency will indeed generate costs, especially in terms of efforts required to adapt the enterprises organizational structure to duties and requirements that companies will have to face. What I am wondering is whether the preemptive protection pursued by the new framework will be worth such costs, both on an individual-firm perspective and from a systemic point of view.

In particular, the empirical analysis consisted in the definition of a population of Italian unlisted companies, comprised in a time frame of observation that spans from 2010 to 2019. Afterwards, a panel logistic regression model has been run on a subset of insolvent firms, combining a dataset of variables with the goal to understand *ex post* the predictive capability of the alerting system.

The Reform

The reform of regulations regarding the business crisis and failure is intended to completely innovate the framework of the Italian Bankruptcy Law. The original approach of the legislation was mainly oriented to the elimination from the market of insolvent firms, with the objective of minimizing as much as possible the corresponding damage for creditors and leaving only few marginal solutions for debtors, yet depending on merit requirements. In a few words, the previous legal framework considered insolvency as something that is always a consequence of either lack of management capabilities or even frauds. For such reasons, punitive actions were believed necessary. The new framework takes inspiration from a clear principle: business crisis and failure regulations must aim at preserving the value of the firms for the sake of a common purpose, rather than liquidating their assets for the mere restorations of creditors' rights. Such new orientation basically comes from the objectives set by international and supranational institutions.

The Reform is defined in such a way that it challenges some endemic cultural characteristics of Italian companies, responsible of causing delays in addressing business crisis and lack of competences in handling it. If a prompt detection of financial troubles is ensured, the total corporate value can be maximized, rather than eroded, pursuing an overall advantage for creditors, employees, owners and the whole economic environment.

In view of this, the most innovative element of the Code is the arrangement of the "alerting instruments and assisted settlement proceedings", intended to ease the emerging of financial distress. The underlying idea is the introduction of a meeting-point between debtors and creditors' needs, with a "mediating" approach assisted by professional organisms.

The objective of the new Code of business default and crisis is to ensure a timely detection of the state of crisis and to defend the entrepreneurship, in such a way that restructuring and settlement activities can be started and carried on preemptively. It might be useful to wrap up the abovementioned arguments, which can be summarized in three broad goals: reforming organically with respect to insolvency proceedings and over-indebtedness crisis; simplifying the overall regulation, in order to overcome interpretative barriers due to contradictory jurisprudences and practices; guaranteeing the legal certainty and improving the efficiency of the economic system so as to make it more competitive.

The system of Indicators

The Indicators are expressed in the first and second paragraph of Article 13 of the Code. Those in the first paragraph are related to all the companies, without distinction; the indicators shown in the second paragraph are characterized by different "industry specific" threshold values.
The system is hierarchical and must be applied according to a pre-selected pattern. When the first threshold value (i) is exceeded, the presence of the crisis is made conceivable. If the first (i) is not exceeded, the second (ii) is verified, and if its threshold is exceeded, the crisis can be hypothesized. In the absence of the data, we move on to the group of indices referred to in Art. 13, para. 2.

The Indicators are the following:

(i) Negative net equity
(ii) six-months DSCR less than 1
(iii) if DSCR is not available, joint exceedance of the thresholds described in the five industry-specific indices, which will be enumerated further in the reading.

The Negative net Equity (i) is the first alerting indicator selected by the CNDCEC, in order to promptly detect the symptoms of potentially incurring state of business crisis.

It is determined by summing Shareholders' Equity, reserves and net results. It may become negative, when losses greater than the sum of the abovementioned figures.

The DSCR (ii) is calculated as the ratio between the free cash flows expected in the following six months that are available for the repayment of debts expected due over the same period. If the resulting values are greater than one, they testify the estimated capacity of sustaining of the debts over a six-month horizon; if values are lower than one, the relative inability of sustainability of the debts is indicated.

It may occur that the equity is positive and the share capital is above the legal limit; it may also be the case that the DSCR is not available or is deemed not sufficiently reliable, due to the inadequate quality of the prognostic data. In such cases, the following 5 industry specific indices (iii) are adopted, with different thresholds depending on the sector of activity. Furthermore, these specific indices must all be alerted together:

a) *index of sustainability of financial charges*, in terms of the ratio of financial charges to turnover. It measures the sustainability of debt charges with the cash flows that the company is able to generate
b) *capital adequacy index*, in terms of the ratio of shareholders' equity to total debt;
c) *index of liquid return on assets*, in terms of the ratio between cash flow and assets. Just like the index of sustainability of financial charges, it defines the sustainability of debt charges with the cash flows that the company is able to generate.
d) *liquidity index*, in terms of the ratio of short-term assets to short-term liabilities. It compares the liabilities payable in the short term with assets that can also be realized in the short term monetarily.
e) *pension and tax debt ratio*, in terms of the ratio of pension and tax debt to assets.

It is very important to keep in mind that these 5 indexes are significant if used simultaneously. Each one, when considered in isolation, provides only partial views of possible signs of crisis. The contextual exceeding of all 5 thresholds established for these indices is therefore required, as stated in the "unitary valuation" of the Legislator.

Methods of analysis

The analysis has been carried with a panel data logistic regression model, applied on a set of companies selected from the industries I have already mentioned before:

wholesale and retail trade (ATECO 2007: G45, G46, G47) and food and restaurant services (ATECO 2007: I56). The regression is intended to highlight the relationship between the existence of the state of alert - defined as a condition of negative Net Worth, or the simultaneous exceedances of the five industry-specific Indicators - and the actual emerging of the state of crisis in at least one of the following years.

The panel data has been developed with data extracted by Aida database, which contains economic and financial data of listed and non-listed Italian companies. First, I have created six new customized financial Indicators, consisting in the computation of the Negative Net Equity and the five alerting Indicators identified by the CNDCEC (National Council of Accounting Experts) presented in Chapter 2. Needless to say, the Indicators have been developed according to the formulations as showed in the document of presentation issued by the CNDCEC.

In every year of the time frame, several anagraphic and financial data have been extracted for each company. In particular: company name, tax code, Ateco 2007 code, region of the registered office with relative ISTAT codes, year of constitution, legal status, eventual default procedures and corresponding starting and closing date of the procedures, total assets, net result. Obviously, in addition to this information, I have collected the values of the six early warning Indicators explained above for each company, in each year of observation. As you will see further in the explanation of the statistical model, six dummy variables have been computed, each one corresponding with one of the default risk Indicators. With respect to the "Negative Net Equity", the dummy variable is 1 when Net Equity is indeed negative, otherwise 0. When it comes to the five industry specific Indicators, the dummy variables are equal to 1, when the alerting threshold is exceeded (in a single year of observation), or equal to 0 when the threshold is not exceeded.

The empirical analysis has been performed on a sub-sample of the population, comprehending all the companies that encountered a crisis in at least one fiscal year in the period of observation, whose variables have been combined in a panel logistic regression:

$$Y_{XT} = a + \beta_{1,T}X1 + \beta_{2,T}X2 + \beta_{n,T}Xn$$

Where:
Y= lag1, lag2 = dichotomous variable that indicates whether the company went into crisis
B1, B2,…Bn = slope coefficients
X1, X2,…Xn = explanatory variables.

The model combines eight explanatory variables and two dependent variables.
The dependent variables are those indicating the occurrence of the business crisis in the following year of statement publishment (lag1), and in the second following year of statement publishment (lag2), with respect to the year of observation. For the former (lag1), the period of observation has been clearly reduced to 2010-2018, since companies observed in 2019 would eventually go into crisis in 2020, but our time frame of observation goes from 2010 to 2019. For the latter (lag2), due to the same reason, the period of observation has been further reduced to 2010-2017.

An important point to clarify is that, in this analysis, the legal definition of business crisis has been adopted, i.e. voluntary procedures have not been taken into consideration for the determination of the status of crisis (e.g., voluntary liquidation, dissolution, voluntary closure of the company, etc.) In the model, the company is considered into crisis *only* when any of these events occurred:

(i) Bankrupt (e.g. *Fallimento*)
(ii) Arrangements with creditors (e.g. *Concordato preventivo*)
(iii) Debt restructuring agreement (e.g., *Accordo di ristrutturazione dei debiti*).

The variables included in the regression model are the following:

Lag1: dependent dichotomous variables which takes value 1, if the company has gone into crisis during the following fiscal year in which financial statements have been published, otherwise 0. I have considered a company to be into crisis when any of these

events occurred: legal bankrupt; arrangements with creditors (e.g. Concordato preventivo); debt restructuring agreement (e.g., accord di ristrutturazione dei debiti).

Lag2: dependent dichotomous variables which takes value 1, if the company has gone into crisis during the *second* following fiscal year in which financial statements have been published, otherwise 0. I have considered a company to be into crisis when any of these events occurred: legal bankrupt; arrangements with creditors (e.g. Concordato preventivo); debt restructuring agreement (e.g., accord di ristrutturazione dei debiti).

ALLERTA: dichotomous variable which takes values 1, if the company is considered on alert status. You should remember that companies are considered on alert status whether they have: (i) Negative net equity; (ii) joint exceedance of the alerting thresholds in the five industry specific Indicators; (iii) both negative net equity and joint exceedance of the five Indicators. Thus, this variable depends on the dummy variables related to the Negative Net Equity and the five alerting Indicators of the Code, as introduced earlier in the "Data collection" paragraph.

TOT_ASS: it indicates the logarithmic value of total assets of the company. It acts as a measure of the size of the firm.

DUMMY_CE: dichotomous variable which takes value 1, if the company is in one of the regions of central Italy, according to the ISTAT regional codes: 09 (Tuscany), 10 (Umbria), 11 (Marche), 12 (Lazio); otherwise, 0

DUMMY_SO: dichotomous variable which takes value 1, if the company is located in one of the regions of southern Italy, according to the ISTAT regional codes: 13 (Abruzzo), 14 (Molise), 15 (Campania), 16 (Puglia), 17 (Basilicata), 18 (Calabria), 19 (Sicily), 20 (Sardinia); otherwise, 0.

AGE: variable which indicates the age of the company, calculated as the difference between the year of observation and the year of establishment.

MISSING_FS: dichotomous variable which takes value 1 if the company has at least one missing financial statement between the first and the last ones available in the time frame of observation.

SPOS: dichotomous variable indicating that the financial statement has arguably been manipulated. It takes value 1 if the ratio between net profit and total assets is comprised between 0 and 2.5%.

CRISIS_INT: variable indicating the intensity of the crisis, compounded as ratio between Loss and Net Equity.

Results and Conclusion

The analysis was intended to assess the predictive capability of the alerting system, introduced by the new Italian Code of business crisis and insolvency, of detecting the occurrence of a crisis in at least one of the years of observation. The layout and functioning of the alerting system has been presented in section 2.5.

The study demonstrates a well-defined correlation between the existence of the status of alert and the emergence of a business crisis in the following year of publishment of financial statements.
This evidence suggests that the alerting system is indeed effective in predicting a crisis, with respect to a short-term perspective. The regression model indeed shows that the status of alert positively influences the emerging of a crisis in the first following year, whereas negatively impacts on the emerging of a crisis in the second following year. Despite this, the data makes us doubt with respect to the real effectiveness of the system in helping companies in acting promptly to avoid a crisis and related consequences. Considering the usual timings of preparation, approval and publishment of financial statements, there is very little room for corrective actions when the activation of the alert occurs. In view of this, it is likely that the thresholds of the Indicators and the choice of the Negative Net Equity are so much close to the crisis, that companies in status of alert are clearly already irremediable. It is natural to wonder whether the benefits of the

concretely outweighs costs, in view of the numerous and complex procedures, requirements, obligations, and involved parties. Steadily and rigorously monitoring financial figures that would make the alert on is objectively costly, also considering that it requires appropriate organizational and administrative resources and capabilities. Not all the companies have the internal efficiencies required by the new Reform: many of them should outsource advising and reporting activities, with an evident negative impact on their financial performance.

But the most relevant problem emerging from the analysis derives from the high positive correlation between the presence of a Negative Net Equity and the exceedance of the five industry specific Indicators. The descriptive analysis shows an average rate of overlap equal to 93%, in subsample of analysis. In practice, the great majority of the activations of the alert is due to the condition of Negative Net Equity, which make the computation of the five industry specific Indicators avoidable and unnecessary (recall that when Net Equity is negative, the alert is on. There is no need for the five Indicators). This evidence has a straightforward consequence, with respect to the role and effectiveness of the five alerting Indicators: most of the companies in alert do not even calculate the five Indicators. Indeed, what emerges from the descriptive analysis is that a very small number of companies go into alert as a consequence of the activation of the five Indicators, compared to those signaled by Negative Net Equity.
In addition, if we match this latter implication with the former regarding the effectiveness of the system in the short-term, we can conclude that the five Indicators would rarely be "on", thus signaling the status of crisis. Furthermore, when they are on, it is too late for companies to recover.

To sum up, the Indicators formally have a predictive capability in predicting a crisis, but this capability is in practice reduced by the strong overlap with the presence of Negative Net Equity, which make them unlike to be computed.
Again, these implications make legitimate to question about the impact of the new system on the whole economic environment, in view of the unsubstantial benefits that it provides.

The negative correlation between the status of alert and total assets suggests that small sized companies are more prone to go into alert, whereas there is a small positive correlation between the age of firms and the activation of the alert, indicating that older companies seem more likely to be signaled. In addition, the regression shows that the dimension of companies has a positive influence on the occurrence of a business crisis in the first following year, confirming that firms size can act as a determinant in view of a possible crisis. Therefore, the data shows that the system of Indicators, as it is today, does not take in consideration the diversities within the industries, in terms of age and dimensions. The CNDCEC openly states that the identification of the critical alerting thresholds of all the Indicators is based on the median value of a subsample of insolvent firms, subsequently adapted to the industrial segmentation. No element of discrimination regarding dimensions and age has been considered, confirming my doubts in Chapter 2. But it is indisputable that small-size firms are more vulnerable in terms of financial structure, and this characteristic should had been taken into account when setting the critical thresholds of the industry specific alerting Indicators.
In addition, it is worth to say that the analysis has demonstrated a positive and significant influence of the variable DUMMY_SOUTH, indicating companies from southern Italy, on the emerging of a crisis in the first following year of publishment of financial statements, suggesting that being a company from the South can result in a higher probability of incurring in a crisis.

In summary, this research work has shed light on some potential limitations arising from the new system of Indicators introduced in Italy by the Code of business crisis and insolvency. According to the empirical analysis, the alerting system demonstrated its capacity in predicting a crisis in the following year, thus proving to be effective in the very short term. Nevertheless, the costs generated by the whole complex of obligations, requirements and structural adjustments seem not to overweigh the actual benefits provided by the system. Indeed, the alerting Indicators signal a small number of companies in the year of observation, and they typically do it when the condition of financial distress appears already irreversible. Signaled firms in financial distress are too close to the crisis, and usually incur in a default procedure within the following year. My question here is therefore: do the expected benefits of the alerting system

significantly justify the corresponding costs? How much does the alerting system weighs on both individual firms and the whole Italian economic environment, in terms of efforts and costs?

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