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Economy, management and business law

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"Economy, management and business law" is a publication that aims to contribute to the improvement of knowledge in the fields of economics and management as well as in disciplines directly related to development, adopting a variety of quantitative and/or qualitative methodologies at both theoretical and empirical levels.

Our policy is to promote scientific work that will lead to significant advances in modern theories. It favors articles that provide sufficient insight into concrete aspects of economic life at microeconomic, macroeconomic and mesoeconomic levels. Authors are invited to compare the results of their studies with their initial hypotheses, within a framework of approaches that align theoretical advances with the realities of the modern economy.

The current challenges facing the global economy are becoming increasingly frustrating: frequent crises, significant imbalances between countries in the North and South, profound inequalities between rich and poor within the same country. As a result, the economic policies proposed by the World Bank, the International Monetary Fund and other economic bodies advocate a single trajectory: economic neoliberalism for greater wealth creation. Can this logic be considered the only way out, especially for less advanced countries?

Note de présentation :

« Economy, management and business law » est une édition qui vise la publication des travaux scientifiques contribuant à améliorer la connaissance dans les domaines des sciences économiques et de gestion ainsi que dans les disciplines ayant un lien direct avec le développement adoptant des méthodologies variées quantitatives et/ou qualitatives sur les plans théorique et empirique.

Sa politique s'inscrit dans une logique de promotion des travaux scientifiques permettant une avancée notable des théories modernes. Elle privilégie les articles portant des éclairages suffisants sur des aspects concrets relatant la vie économique tant aux niveaux microéconomique, macroéconomique que mésoéconomique. Les auteurs sont invités à confronter les résultats de leurs études aux hypothèses de départ et ce dans un cadre d'approches arrimant les avancées théoriques sur les réalités de l'économie moderne.

Les enjeux actuels de l'économie mondiale sont de plus en plus frustrants : crises fréquentes, déséquilibres notables entre les pays du nord et ceux du sud, inégalités profondes entre les riches et les pauvres au sein d'un même pays. En conséquence, les politiques économiques proposées par la Banque mondiale, le Fonds Monétaire international ainsi que d'autres instances économiques plaidant pour une seule et unique trajectoire : le néolibéralisme économique pour plus de création de richesse. Cette logique peut-elle être considérée comme l'unique issue surtout pour les pays moins avancés ?

Nota de Apresentação:

Neste número dedicado à "Economia, gestão e direito empresarial" organizado a partir da *Université Hassan II de Casablanca* por investigadores da *Faculté des Sciences Juridiques Economiques et Sociales*, visamos contribuir para a melhoria do conhecimento nos domínios da economia e da gestão, bem como em disciplinas diretamente relacionadas com o desenvolvimento, adotando uma variedade de metodologias quantitativas e/ou qualitativas, tanto a nível teórico como empírico. O nosso propósito é o de promover a discussão e partilha de trabalhos científicos que

conduzam a avanços significativos nas teorias modernas. Foram privilegiados os artigos que fornecem uma visão abrangente de aspetos concretos da vida económica a nível microeconómico, macroeconómico e mesoeconómico. Os autores foram convidados a comparar os resultados dos seus estudos com as suas hipóteses iniciais, num quadro de abordagens que alinhe os avanços teóricos com as realidades da economia moderna. Os desafios atuais da economia mundial são cada vez mais frustrantes: crises frequentes, desequilíbrios significativos entre países do Norte e do Sul, desigualdades profundas entre ricos e pobres dentro de um mesmo país. Consequentemente, as políticas económicas propostas pelo Banco Mundial, pelo Fundo Monetário Internacional e por outros organismos económicos defendem uma única trajetória: o neoliberalismo económico para uma maior criação de riqueza. Poderá esta lógica ser considerada a única saída, nomeadamente para os países menos avançados?

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Monetary policy challenges in Morocco: exploring the possibility of reconciling price stability and economic growth.

Desafios da política monetária em Marrocos:
explorar a possibilidade de conciliar a estabilidade dos preços e
o crescimento económico

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Abstract: In this research paper, we used the VECM framework to assess Moroccan central bank's ability to target inflation. We also explored the possibility of reconciling between inflation control and growth stimulation through an impulse response analysis. Our empirical results showed that interest rate adjustments as monetary policy measure could be a relevant choice in a context of moderate and short-lived inflation since it provides a wide margin for reconciling price stability and economic growth. In times of high and persistent inflation, the central bank should prioritize inflation control through a permanent decrease in its money supply.

Keywords: Monetary Policy, inflation, economic growth, reconciliation.

JEL classification: E31, E52, F43

Resumo: Neste artigo de investigação, utilizámos o quadro VECM para avaliar a capacidade do banco central marroquino de atingir a inflação. Também explorámos a possibilidade de conciliação entre o controlo da inflação e a estimulação do crescimento através de uma análise de resposta ao impulso. Os nossos resultados empíricos mostraram que os ajustamentos das taxas de juro como medida de política monetária podem ser uma escolha relevante num contexto de inflação moderada e de curta duração, uma vez que proporcionam uma ampla margem para conciliar a estabilidade de preços e o crescimento económico. Em tempos de inflação elevada e persistente, o banco central deve dar prioridade ao controlo da inflação através de uma diminuição permanente da sua oferta monetária.

Palavras-chave: Política Monetária, inflação, crescimento económico, reconciliação.

1. Introduction

The trade-off between price stability and economic growth is one of the major concerns of monetary policies. Central banks tend to prioritize the stimulation of economic activity in times of crises and focus their efforts on reducing inflationary pressures in a context of overheating economy or commodity price shocks. The trade-off between targeting inflation and boosting growth is also a matter of monetary authorities' strategic choices. For example, the growth dimension is covered by the functions of the Federal Reserve, which set a goal of promoting maximum employment and stable prices. Conversely, the European Central Bank adopts a more restrictive stance by focusing its policy on price stability. Taking into account these two benchmark cases as well as the available theoretical and empirical literature, the present research paper proposes an empirical assessment of the monetary policy stance in Morocco.

A large strand of empirical literature on monetary policy in developing economies remains strictly focused on one goal (i.e. price stability or growth stimulation). Our research paper goes beyond this scope by exploring the possibility of reconciling the two objectives. Indeed, the estimation of a VECM (i.e. Vector Error Correction Model) and the interpretation of its coefficients will provide an assessment of Moroccan central bank's ability to target inflation. In addition, the analysis of impulse response functions will allow us to draw some interesting conclusions about the possibility of reconciling between targeting inflation and supporting economic growth in Morocco.

2. Literature review

The general theory (Keynes, 1936) supports the use of monetary policy (i.e. in combination with fiscal policy) as an effective growth stimulation tool in times of downturn. This theory emphasizes the key role of monetary expansion (i.e. increase in money supply) in boosting economic activity. The contributions of (Harrod, 1937; Hicks, 1937; Meade, 1937) provide a mathematical structure to the Keynesian approach. The positive effect of expansionary monetary policy on growth is also backed up by the graphical analysis proposed by (Hansen, 1949,

1951, 1953) in his IS-LM model. Other contributions draw the same conclusions in a context of small open economy with flexible exchange rates (Fleming, 1962; Mundell, 1960, 1963). In addition, the aggregate aggregate demand / aggregate supply framework simplify the analysis of monetary policy effects on economic activity under the hypothesis of flexible price level (e.g. (Baumol & Blinder, 1985; Stiglitz, 1993)). In contrast with the Keynesian approach, (Sargent & Wallace, 1981) focus on the creation of a sound macroeconomic environment through the adoption of a monetary dominance scheme in which independent central banks direct their efforts towards inflation control rather than supporting government's growth stimulation policies. Indeed, inflation must be the central bank's primary concern according to (Rogoff, 1985). The author states that the ideal central banker places a large, but finite, weight on price stabilization.

A large array of research papers have examined the implications of monetary policy on inflation and economic activity. Other studies have restricted the analysis to one monetary policy goal (i.e. price stability or growth stimulation). The following table presents a brief review of the empirical literature.

Table 1. A brief empirical literature review

Authors	Model	Period, frequency and country	Variables	Main results
(Sims, 1992)	SVAR	1957-1991 Monthly France, Germany, Japan, U.K. and U.S.	Short term interest rate, monetary, aggregate (M1), consumer price index, industrial production index, index of the foreign exchange value of domestic currency and commodity price index.	There is a persistent negative response of money stock and output to interest rate shocks in the five sample countries. Prices show a temporary positive reaction. Taking into account monetary shocks, the reaction of prices is positive whereas the response of economic activity is small or predominantly negative.
(Starr, 2005)	SVAR	1995-2003 quarterly Russia, Ukraine, Belarus, and Kazakhstan	Money supply (M1 or M2), central bank's refinancing rate, real effective exchange rate, real GDP and consumer price index.	There is mixed evidence that monetary policy variables (i.e. money supply, policy rate and exchange rate) have a significant effect on real output. However, these variables provide an explanation for price fluctuations in the four sample countries.

(Uhlig, 2005)	SVAR	1965-2003 Monthly United States	Real GDP, GDP deflator, commodity price index, total reserves, non-borrowed reserves and federal funds rate.	Shocks to monetary policy variables (i.e. restrictive stance) have an ambiguous effect on real GDP and lead to a slow decrease in GDP price deflator.
(Sousa & Zaghini, 2008)	SVAR	1980-2001 Quarterly Euro area	GDP deflator, consumer price index, real GDP, monetary aggregate (M3), short term interest rate, exchange rate, and global liquidity aggregate	Money supply and price level show a permanent positive reaction to shocks in global liquidity. The response of output is temporary and positive. In addition, global liquidity shocks result in a temporary appreciation of real effective exchange rate.
(Chiaraah & Nkegbe, 2014)	ECM	1980-2010 Annual Ghana	GDP, money supply, exchange rate, domestic price level and United states' price level (i.e. proxy of foreign price level).	Reflecting the monetary policy stance, money supply has a significant positive effect on inflation rate in the long term. Its impact is not significant in the short-term according to the error correction model.
(Ahmad et al., 2016)	ARDL	1973-2014 Annual Pakistan	GDP, money supply, inflation, interest rate and exchange rate	According to the long-term equation, monetary policy stimulate economic activity through money supply and exchange rate, which have a significant positive effect on GDP. The impact of exchange rate and interest rate is positive and significant in the short-term.
(Wauk & Adjorlolo, 2019)	ARDL	1982-2017 Annual Ghana	GDP, inflation, exchange rate, money supply (M2) and interest rate.	Interest rate exhibits a significant negative impact on economic activity in the long term. The effects of the other monetary policy variables (i.e. exchange rate and money supply) are insignificant in the long and short terms.
(Gillani & Abdin, 2021)	ARDL	1981-2014 Annual Pakistan	Consumer price index, liquidity ratio, reserve ratio and money supply (M2).	Money supply shows a positive and significant effect on price level according to the long-term equation. Pakistani central bank can control inflation through an effective management of money supply.

Source: author

3. Methodology

Our empirical study assesses Moroccan central bank's ability to control inflation and explores the possibility of reconciling between the two major challenges of monetary policy (i.e. maintaining price stability and boosting economic growth). We test two major hypotheses:

- Hypothesis I: Moroccan central bank manages to control inflation effectively.
- Hypothesis II: Moroccan central bank manages to reconcile between targeting inflation and supporting economic growth.

The sources of data are Bank Al-Maghrib (i.e. the Moroccan central bank), the Ministry of Economy and Finance as well as the High Commission for planning. We use annual time series from 1980 to 2020. Inflation rate (*if*) and natural logarithm of gross domestic product (*lgdp*) are the ultimate goals of monetary policy. Interbank rate (*r*) and money supply (*m*) (i.e. aggregate M3 as percentage of GDP) react immediately to central bank's decisions and hence reflect the orientation of its policy. Government expenditure (*ex*) and current account balance (*ca*), (expressed as percentage of GDP), reflect respectively the potential impact of fiscal policy measures and foreign trade dynamics on price level.

The estimation of a VECM that includes the above-mentioned variables and the interpretation of its coefficients will provide an assessment of Moroccan central bank's ability to target inflation. In addition, the analysis of impulse response functions will allow us to draw some interesting conclusions about the possibility of reconciling between targeting inflation and supporting economic growth in Morocco.

In the presence of a cointegrating relationship, a VECM can be formulated as follow:

$$\Delta Y_t = A_0 - \alpha \beta' Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \mu_t \quad (1)$$

Where:

- Y_t : ($k \times 1$) vector of I(1) variables.
- A_0 : ($k \times 1$) vector of constant terms.
- α : ($k \times 1$) vector of adjustment coefficients.
- $\beta' Y_{t-1}$: error correction term.
- Γ_i : matrix of coefficients.
- μ_t : ($k \times 1$) vector of white noise terms.

4. Result and discussion

Since all the variables are integrated of order one, we use Johansen methodology to test for cointegration. According to the Akaike Information Criterion, the optimal lag length is ($p = 3$), (table A1).

Table 2. Unit root test results

Variable	ADF Level	ADF First difference	Conclusion
<i>if</i>	-3.303088 (-3.533083)	-9.861962 (-1.949609)	I(1)
<i>lgdp</i>	-2.472942 (-2.943427)	-7.815392 (-3.529758)	I(1)
<i>ca</i>	-2.234832 (-2.936942)	-6.695907 (-1.949609)	I(1)
<i>ex</i>	-2.023406 (-2.936942)	-6.753428 (-1.949609)	I(1)
<i>r</i>	-2.638866 (-3.526609)	-6.519686 (-1.949609)	I(1)
<i>m</i>	-2.046247 (-3.526609)	-4.780857 (-2.938987)	I(1)

(): critical values for the 5% significance level.

Table 3. Cointegration test results

(a)

Unrestricted Cointegration Rank Test (Trace)		
Hypothesized No. of CE(s)	Trace statistic	0.05 critical value
None *	140.1288	95.75366
At most 1 *	91.24448	69.81889
At most 2 *	52.10655	47.85613
At most 3	27.08643	29.79707

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level.

* Denotes rejection of the hypothesis at the 0.05 level.

(b)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)		
Hypothesized No. of CE(s)	Max-Eigen statistic	0.05 critical value
None *	48.88435	40.07757
At most 1 *	39.13792	33.87687
At most 2	25.02012	27.58434

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level.

* Denotes rejection of the hypothesis at the 0.05 level.

The Johansen test (i.e. trace statistic) indicates the existence of three cointegrating equations, which justifies the estimation of a VECM with $(p - l = 2)$ lags. We are interested in analysing the cointegrating equation as well as the short-term dynamics of inflation.

Table 4. Long-term relationship (i.e. cointegrating equation)

<i>if</i>	<i>lgdp</i>	<i>ca</i>	<i>ex</i>	<i>r</i>	<i>m</i>	<i>c</i>
1	0.095693* [3.98086]	-0.073590 [-0.53949]	-0.038589 [-0.17508]	- 0.626209* [-3.35873]	- 0.173186** [-2.70415]	-1.093110

[] t-statistic.

* Significance at the 1% level. ** Significance at the 5% level.

Table 5. VECM: short-term dynamics of inflation

D(if)			
CointEq1	-0.899804 [-4.66138]*		
D(if(-1))	0.443527 [2.08075]**	D(ex(-1))	-0.247709 [-1.23112]
D(if(-2))	0.310543 [2.00879]**	D(ex(-2))	-0.764502 [-4.25020]*
D(lgdp(-1))	-0.127935 [-1.75101]***	D(r(-1))	-1.132347 [-4.49963]*
D(lgdp(-2))	-0.100794 [-1.25549]	D(r(-2))	0.099657 [0.46483]
D(ca(-1))	0.001938 [0.01339]	D(m(-1))	0.147200 [1.26580]
D(ca(-2))	-0.439624 [-3.34892]*	D(m(-2))	-0.144601 [-1.27579]
c	0.012461 [1.82313]***		
R-squared: 0.777962			

[] t-statistic.

* Significance at the 1% level. ** Significance at the 5% level. *** Significance at the 10% level.

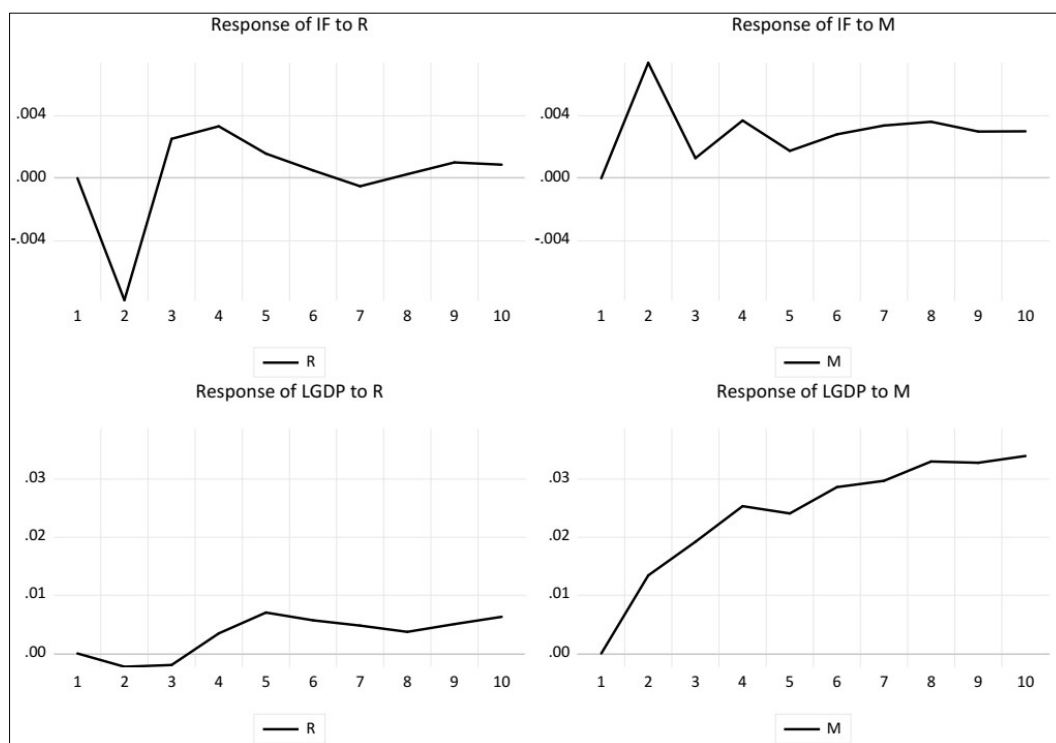
The negative sign and significance of the adjustment coefficient (i.e. estimated at -0.89) as well as the results of residual tests (i.e. normality, autocorrelation and heteroskedasticity) confirm that our VECM is valid, (table A2).

In light of the long-term relationship, a 1 percentage point increase in interbank rate leads to a slight rise in inflation estimated at 0.62 percentage point. This positive effect is statistically significant, which indicates that interest rate based monetary policy is not effective at maintaining price stability in the long-term. In addition, inflation rate increases by 0.17 percentage point following a positive variation in money supply equivalent to 1 percentage point of GDP. This significant positive link between the two variables means that monetary authorities could generate a long-term decrease in inflation by reducing permanently their money supply especially in times of high inflationary pressures. The long-run coefficient associated to GDP is significant and estimated at -0.095, which reveals the negative effect of this variable on price level. As for government expenditure and current account balance, they do not play a significant role in explaining inflation long-term dynamics.

In the short-term, monetary authorities could maintain inflation at a low level by prioritizing the adjustment of interest rate as a key monetary policy variable. Indeed, inflation is negatively related to interbank rate and the coefficient associated to this predictor is significant and estimated at -1.13. Conversely, the central bank seems unable to stabilize prices through an adjustment of its money supply since aggregate M3 has no significant impact on inflation rate in the short-run. GDP, government expenditure and current account balance do not exert an upward pressure on prices, which is reflected by their negative and significant short-term coefficients (i.e. estimated at -0.12, -0.76 and -0.43 respectively).

In overall, Moroccan central bank could manage to control inflation effectively by prioritizing the use of interest rate as a policy variable in the short-term and by adjusting its money supply in the long term.

We focus our next analysis on impulse response functions in order to explore the possibility of reconciling between targeting inflation and supporting economic growth in Morocco.

Figure 1. Response to one standard deviation innovations

Following a positive shock in interbank rate, inflation drops substantially in the short-term (i.e. over the first two years), shows a positive reaction over the next three years and returns to its initial baseline by the end of the sixth year, which confirms our previous findings. Indeed, prioritizing the adjustment of interest rate as a monetary policy variable allows an effective control of inflation in the short-term. In addition, output shows a limited negative reaction to shock in interbank rate over the three first years before moving upward starting from the fourth year. The direction of output response indicates that a restrictive monetary policy based on interest rate does not hamper significantly economic activity. Finally, the impact of an increase in money supply on inflation and output is positive and noticeable over the analysis period. Thus, a monetary expansion stimulates economic activity and generates inflationary pressures that last in the long term.

In light of the impulse response analysis, there is a margin for reconciliation between price stability and economic growth whenever monetary authorities base their inflation control efforts on interest rate adjustment. Indeed, an increase in central bank's policy rate alleviates inflationary pressures in the short-term without

hampering economic activity. The margin for reconciliation between inflation control and growth becomes tighter if central bank's price stabilization efforts are based on a permanent contraction in money supply. Indeed, a positive shock in this variable produces a long-term positive effect on price level and output, which means that monetary contraction would curb inflation and reduce the economy's growth potential.

5. Conclusion

In this research paper, we used the VECM framework to assess Moroccan central bank's ability to target inflation. The interpretation of the model's coefficients allowed us to draw some interesting conclusions about the short and long-term implications of monetary policy in Morocco. In addition, we explored the possibility of reconciling between inflation control and growth stimulation through an impulse response analysis.

An interest rate based monetary policy is not effective at maintaining price stability in the long-term. However, monetary authorities could generate a long-term decrease in inflation by reducing permanently their money supply especially in times of high inflationary pressures. In the short-term, monetary authorities could maintain inflation at a low level by prioritizing the adjustment of interest rate as a key monetary policy variable. Conversely, the central bank seems unable to stabilize prices in the short-run through an adjustment of its money supply.

An increase in central bank's policy rate eases inflationary pressures in the short-run without reducing the economy's growth potential. This result reveals the existence of a margin for reconciliation between price stability and economic growth whenever the central bank bases its inflation control efforts on interest rate adjustment. This margin becomes tighter if monetary authorities attempt to curb inflation through a permanent monetary contraction since reducing money supply would hamper economic activity.

Prioritizing interest rate adjustments as monetary policy measure could be a relevant choice in a context of moderate and short-lived inflation since it provides a wide margin for reconciling price stability and economic growth. In times of high and persistent inflation, the central bank should prioritize inflation control through a permanent decrease in its money supply.

Appendixes

Table A1. VAR lag order selection criteria

Lag	LR	FPE	AIC	SC	HQ
1	NA	3.97e-21	-29.96437	-28.41297*	-29.41239*
2	47.78193	4.73e-21	-29.90740	-26.80460	-28.80344
3	51.13413*	3.49e-21*	-30.56936*	-25.91517	-28.91344

Table A2. VECM residual tests

Autocorrelation LM test	White heteroskedasticity test	Normality test
0.525526 (0.9623)	515.6943 (0.8197)	18.06903 (0.1136)

() P-value.

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The determinants of school performance in selected MENA countries: what role of the education system's characteristics?

Os determinantes do desempenho escolar em países seleccionados do Médio Oriente e do Norte de África: qual o papel das características do sistema educativo?

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Abstract: Based on data from the 2011 TIMSS international survey related to the 2nd year of secondary school of eleven MENA countries, this work aims to identify the characteristics of the educational system that influence the students' academic performance in mathematics in these countries, while highlighting the case of Morocco.

The estimation of an empty three-level model, to explain the probability of achieving a score of 400 points or more in mathematics, showed that a significant and non-negligible part (8.04%) of the total variance is due to the differences between the characteristics of the countries. The results of this study showed that, particularly in Morocco, students' academic performance could be improved by providing autonomy to schools to choose the syllabus, by making preschool a obligatory educational cycle and by increasing the volume of time reserved for teaching mathematics.

Keywords: Education, school performance, TIMSS-MENA, multilevel models.

Resumo: Com base nos dados do inquérito internacional TIMSS 2011 sobre o 2.º ano do ensino secundário para onze países do MENA (Médio Oriente e do Norte de África), este estudo tem como objetivo identificar as características do sistema educativo que influenciam o desempenho matemático dos alunos nos países da amostra, destacando o caso de Marrocos. A estimação de um modelo de vácuo de três níveis para explicar a probabilidade de os alunos alcançarem uma pontuação de 400 pontos ou mais em matemática revelou que uma proporção significativa e não negligenciável (8,04%) da variância total se deve a diferenças entre as características dos países. Os resultados deste estudo mostraram que, nomeadamente em Marrocos, o desempenho académico dos alunos poderia ser melhorado concedendo autonomia às escolas na escolha dos programas, tornando o ensino pré-escolar obrigatório e aumentando o tempo consagrado ao ensino da matemática.

Palavras-chave: Educação, desempenho escolar, TIMSS-MENA, modelos multinível.

Résumé : Basé sur les données de l'enquête internationale TIMSS 2011 relatives à la 2^{ème} année de l'enseignement secondaire collégial concernant onze pays de la zone du MENA, ce travail a pour objectif l'identification des caractéristiques du système éducatif qui influent sur la performance scolaire en mathématique des élèves des pays de cet échantillon, tout en mettant en lumière le cas du Maroc.

L'estimation d'un modèle vide à trois niveaux, pour l'explication de la probabilité que les élèves réalisent un score supérieur ou égal à 400 points en mathématiques, a permis de constater qu'une part significative et non négligeable (8,04%) de la variance totale est due aux différences entre les caractéristiques des pays.

Les résultats de cette étude ont montré, que particulièrement au Maroc, le rendement scolaire des élèves pourrait être amélioré en accordant une autonomie aux établissements dans le choix des programmes scolaires, en faisant du préscolaire un cycle d'enseignement obligatoire et en augmentant le volume horaire réservé à l'enseignement des mathématiques.

Mots-clés : Education, performance scolaire, TIMSS-MENA, modèles multiniveaux.

Introduction

Like most developing countries, MENA¹ countries invest significant resources to improve their education systems. According to a World Bank study (2008), these countries have devoted more financial resources to education compared to other countries with similar per capita income levels.

While Morocco devotes nearly 17 percent of government spending to education², and despite numerous reforms to its education system, the country remains behind the MENA countries in terms of student performance. Both international and national surveys have revealed that the level of student achievement in Morocco is marked by major weaknesses.

For example, the international TIMSS³ study conducted in 2011 showed that the country's average score was only 371 points in mathematics, whereas the international average is 500 points (MULLIS et al, 2012). With this score, Morocco is ranked at the bottom of the MENA region.

Moreover, according to the results of the 2008 national study PNEA (Programme National de l'Evaluation des Acquis), conducted by the INE (Instance

¹ Middle East and North Africa.

² The share of government spending on education reached 17.2% in 2012 and 16.9% in 2021. These expenditures represent 6.2% in 2012 and 6.8% in 2020 of GDP, respectively ([Http://donnees.banquemondiale.org/indicateur](http://donnees.banquemondiale.org/indicateur)).

³ Trends in International Mathematics and Science Study.

Nationale d'Evaluation du Système de l'Education, de la Formation et de la Recherche Scientifique (INE-SEFRS)) at the national level, 92% of Moroccan students in the 2nd year and 84% in the 3rd year of secondary school achieved scores in mathematics far below the national average. Similarly, in physics-chemistry and life and earth sciences, these percentages reached 86% and 90%, respectively, for students in the 3rd year of the same cycle (INE-CSEFRS (2014)).

Following a comparative approach and based on TIMSS data, this work consists in identifying the educational system characteristics that influence students' mathematics performance in eleven MENA countries that participated in this survey and deducing the main differences between these countries. It is also to determine the main factors of Morocco's performance compared to these countries. To do so, we will apply multilevel models in order to take account of the hierarchical nature of the data.

This work has a double interest : It is a contribution to analyse the characteristics of mathematics performance of a sample of MENA countries, particularly Morocco, while underlining the factors related to the national education system. It also seeks to identify the causes of our country's low ranking among the MENA countries examined. The results of this work will provide a useful contribution for decision makers to better define the required corrective actions.

After a review of the literature on the determinants of school performance, especially those related to national characteristics, the study will present a comparative statistical analysis of the school performance of the selected countries, with a focus on the case of Morocco. Finally, we present the multilevel models and discuss the estimations results and the main conclusions.

1. School performance and national characteristics : a literature review

Many studies tried to explain school performance by using variables related to national characteristics. These can be grouped into two categories: economic and social characteristics on the one hand, and variables related to the education system on the other hand⁴.

1.1. Importance of economic wealth and education spending

Some studies have highlighted the positive effect of the economic growth rate

⁴ For more detail on this issue, see Abbaia (2017).

on student performance. Particularly, Hanushek and Woessmann (2006) have shown that there is a positive and significant relationship between school performance and the growth rate of GDP per capita.

Similarly, Lee and Barro (2001) have shown that the economic wealth of the country, as well as the school resources, have a significant effect on the academic performance of students. Indeed, using panel data of many countries, these authors found a positive and significant effect of teacher remuneration on students' test scores. However, the study found a negative, but not significant, effect of education spending on student scores.

Similarly, when Gupta et al. (1999) measured the quality of education by the enrolment and persistence rate of students up to the fourth grade of primary school, they showed that while total spending on education has only a small effect on persistence, the share of spending on primary and secondary education has a positive and significant effect on the quality of education.

Furthermore, in a study of school efficiency and equity in several countries, Hanushek and Luque (2003) used TIMSS 1995 data from 35 countries. The objective was to study the impact of resources such as improved teacher training and smaller class sizes on student academic performance. The results showed, on the one hand, that the effect of resources does not seem to be related to the income level of the country, and that the problem is related to resource inefficiency on the other hand.

In a paper on MENA countries, Heyneman (1997) concluded that the low quality of education in these countries is not due to financial problems, but is rather the result of inefficient management of resource allocation, characterized in these countries by centralized planning.

Heyneman and Loxley (1982) showed that a country's level of economic development, measured by gross national product (GNP), determines the extent of the relationship between school resources and household socio-economic status on the one side and school performance on the other. Using data collected in 1970, these authors showed an important effect of household socio-economic status in developed countries, while the impact of school resources is limited. For developing countries, the results showed a stronger school effect than the household

socioeconomic status one.

Generally speaking, and as concluded by Leclercq (2005), studies seeking to investigate the relationship between education expenditure and school performance have failed to establish a robust empirical pattern.

1.2. Effects of education system characteristics

Among studies on the origins of inequalities in school performance, several factors related to the education system have attracted the attention of researchers. Essentially, these are the degree of school autonomy, the outsourcing of examinations, the adoption of early separation of students into different educational pathways, and the situation of pre-school education.

- *School autonomy*

Since local decision-makers are the most qualified to make the right decisions and actions in order to improve the quality of education at the local level, several researchers have studied the effect of autonomy or decentralization of school-level policy-making on students' academic performance.

Several studies have revealed that students perform better when the education system has more autonomy in school management (Woessmann (2001, 2003b), Falch and Fischer (2008b), Fuchs and Woessmann (2007), Woessmann, Luedemann, Schuetz and West (2009)).

Using TIMSS 1995 data for some East Asian countries, Woessmann (2003b) showed that the resources allocated and in particular the size of the class did not have a strong impact on student performance. The author also found that school policies, such as school autonomy in terms of salaries (Japan and Singapore), and the regular assignment of homework (Hong Kong, Japan and Singapore), had a significant impact on students' scores.

- *Examination system*

The outsourcing of examinations is considered by researchers to be a key factor in explaining differences in school performance between students in different education systems. The involvement of an external agency in conducting examinations provides an objective assessment of the quality of education and, consequently, of the performance of local educational managers.

In a study based on 1991 IAEP (International Assessment of Educational Progress) data of several countries, Bishop (1995) found that when the education system is based on examination outsourcing, students perform better in mathematics and geography. According to this author, this positive relationship is associated with higher teacher recruitment requirements.

In some countries, the examination system is managed either at the national or local (regional or provincial) level.

The centralized examination system allows a comparison of students' academic performance and, consequently, of the performance of schools and of the deconcentrated and decentralized services of the government authority in charge of educational affairs. Consequently, centralized testing is used by several researchers to explain differences in student achievement across countries (Bishop (2006), Woessmann (2002, 2005c)).

Using 1995 TIMSS data (39 countries) and TIMSS-Repeated data (38 countries) covering 450,000 students, Woessmann (2002) found that students from countries with a centralized testing system had higher scores in mathematics than students from countries without a centralized testing system.

- *Early separation and orientation*

Some countries adopt the separation of pupils and early selection model. From the end of elementary school, pupils are oriented, according to their results, towards different educational tracks.

Researchers have considered the early orientation and separation of pupils as important factors in explaining school performance inequalities. Thus, some empirical work carried out in France has shown that the early separation of pupils into unequal tracks produces and increases inequalities in achievement according to social origin (Girard and Bastide (INED, 1966) Baudelot and Establet (1971)). These results have been confirmed by more recent studies : Based on PIRLS, TIMSS, and PISA (Programme for International Student Assessment) data from several countries, Hanushek and Woessmann (2006) have shown that the organization into streams contributes to the widening of inequalities between students from one level to another.

According to an OECD study (2005e), countries with earlier orientation in their education systems performed on average less than countries with more

integrated education systems in the PISA 2000 tests.

- *Preschool education status*

Preschooling is intended to prepare children through pre-learning, mentoring, and familiarization with the learning environment for elementary school in order to ensure that they have every opportunity to succeed.

Preschooling is intended to prepare children through pre-learning, mentoring, and familiarization with the learning environment for elementary school in order to ensure that they have every opportunity to succeed.

Using 1995 TIMSS and TIMSS-R data for 54 countries, Schuetz, Ursprung, and Woessmann (2008) concluded that a long preschool duration improves equality of opportunity for school success. In addition, the preschool cycle duration adopted by the education system weakens the effect of the family's socioeconomic background on school performance.

Schuetz (2009) showed, in a paper based on the 2003 PISA data, that pre-school attendance is positively associated to student scores. The author also concluded that the effect of pre-primary attendance on test scores is greater in countries with higher per-pupil spending on pre-primary education, in those countries with a large share of private schools, and also in countries with well-trained and well-paid preschool teachers.

2. Statistical analysis of school performance : focus on the Moroccan case

This study is based on a secondary analysis of the 2011 TIMSS database for eleven MENA countries that participated in this survey. It focuses on 2nd year secondary school students. Our sample is composed of 73,260 students from 2,387 schools across 11 MENA countries :

Table 1: Characteristics of samples by country

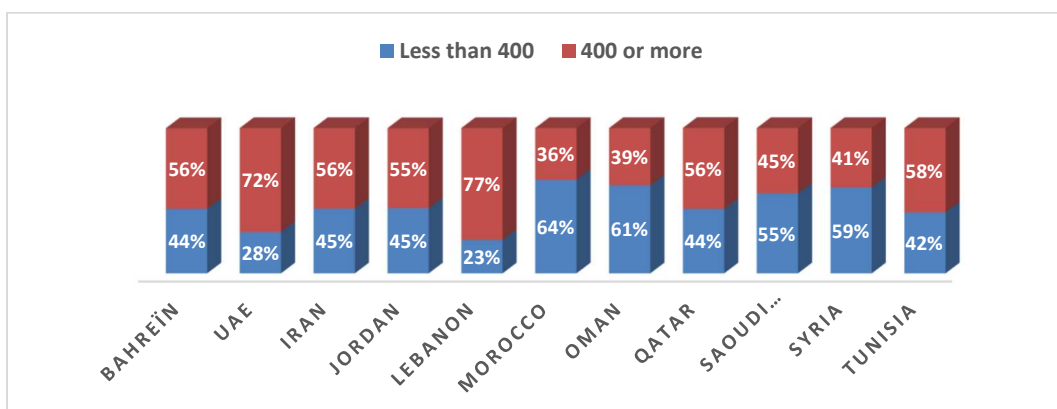
Countries	Number of schools *	Number of students*	Country average score in mathematics **	Math score of 400 or higher (% of students)**
Bahreïn	95	4 640	409	56
United Arab Emirates	458	14 089	456	72
Iran	238	6 029	415	55
Jordan	230	7694	406	55
Lebanon	147	3974	449	77
Morocco	279	8985	371	36
Oman	323	9542	366	39
Qatar	109	4422	410	56
Saoudi Arabia	153	4344	394	45
Syria	148	4413	380	41
Tunisia	207	5128	425	58

Sources : * 2011 TIMSS database ; **authors' calculations from 2011 TIMSS database.

Evidence from Table 1 shows that, compared to the countries in our sample, Moroccan students achieved the lowest scores in mathematics. With an average score of 371, Morocco placed second to last followed by Oman with a score of 366. The United Arab Emirates followed by Lebanon occupied the first and second places with average scores of 456 and 449 respectively.

Moreover, graph 1 shows that 64% of Moroccan students and 61% of Omani students have scores below 400 points, recording, thus, the highest percentages of students with scores that can be considered as « very low»⁵.

Graph 1: Distribution of students by score



Sources : 2011 TIMSS database, authors' calculations.

This study aims to analyze, through a comparative approach, Moroccan

⁵ It is important to stress that the TIMSS study considers any score between 400 and 475 points as low. Therefore, we have qualified any score below 400 points as very low level.

educational performance compared to MENA countries and to identify the causes of the low ranking of Morocco among these countries.

2.1. National characteristics of the selected countries

Two sets of national-level variables of our sample are used in this study. The first category includes economic and social characteristics. Essentially, it concerns spending on education and the literacy rate. The second category concerns variables related to education systems.

Table 2 : Countries' socio-economic characteristics

Pays	Spending on education/GDP ⁶	Education expenditure per pupil (in constant US \$ 2009) ⁷	Expenditure per secondary school pupil (% of GDP per capita) ⁸	Literacy rate ⁹ (%)
Bahreïn	2,50	---	10	94,56
United Arab Emirates	1,20	2 773	12	90,03
Iran	4,79	830	20,28	85,02
Jordan	4,95	474	14,79	92,55
Lebanon	2,04	462	3,73	89,61
Morocco	5,56	459	30,73	67,08
Oman	4,19	2 320	14,38	86,94
Qatar	2,45	6 157	10,29	96,28
Saoudi Arabia	5,14	1 151	18,11	94,43
Syria	4,60	411	14,95	85,08
Tunisia	6,27	762	24,42	79,13

Source : World Bank data (<http://donnees.banquemondiale.org/indicateur>)

Table 2 reveals that although Morocco has limited resources and has made a significant budgetary effort to improve education, it has not performed as well as other countries such as Qatar, Bahrain, and the UAE in terms of both quantity and quality of education. Indeed, according to different studies, in all disciplines and at all grades studied, students' scores remain low compared to other countries participating in these programs. On the quantitative side, Morocco has the lowest

⁶ Data refer to the year 2008 or the closest year for which information is available.

⁷ This is the average expenditure over the period 2002-2010, all cycles combined.

⁸ This is the share recorded in 2009 or the closest year.

⁹ This rate represents the percentage of people aged 15 and over who are literate. It is the rate recorded in 2010 or the nearest year.

literacy rate among all the countries in our sample. While this rate is close to 90% in these countries, it is only 67.08% in Morocco.

The variables related to national education systems (Table 3) were extracted from the TIMSS¹⁰ database. They include the time devoted to mathematics, the school's autonomy in choosing the syllabus, the mandatory nature of pre-school education, the pupil/teacher ratio, and the requirement of a professional qualification examination for teachers.

Table 3 : Countries' education systems characteristics

Pays	Mandatory pre-school education *	Requirement of a professional qualification examination for teachers *	School autonomy in curriculum choice *	Time spent on mathematics (% of school time)*	Secondary school pupil-teacher ratio ^{11**}
Bahreïn	Non	Non	Oui	17	12
United Arab Emirates	Oui	Non	Oui	15	17
Iran	Non	Non	Non	12	20
Jordan	Oui	Non	Non	15	20
Lebanon	Oui	Non	Oui	17	14
Morocco	Non	Oui	Non	13	26
Oman	Non	Oui	Oui	17	20
Qatar	Oui	Non	Non	17	11
Saoudi Arabia	Oui	Oui	Oui	12***	11
Syria	Oui	Oui	Oui	13	25
Tunisia	Oui	Oui	Non	11	17

Source :

* : 2011 TIMSS database (<http://timssandpirls.bc.edu/timss2011/international-database.html>)

(T11_G8_CQ_Data) ;

** : World Bank data (<http://donnees.banquemondiale.org/indicateur>)

*** : Author's estimate ¹².

The analysis of these variables shows that the budgetary effort deployed by

¹⁰ This database is available on the IAE website (<http://timssandpirls.bc.edu/timss2011/international-database.html>) T11_G8_CQ_Data. For more information on these data, see Pierre Foy, Alka Arora, and Gabrielle M. Stanco (2013).

¹¹ This is the ratio recorded in 2011 or the closest year.

¹² Dividing the average number of hours spent on mathematics by the number of hours of instruction.

Morocco has not led to an improvement in student learning conditions, compared to other countries such as Qatar, Saudi Arabia or Bahrain, which have achieved remarkable performance in this area. For example, data in Table 3 show that Morocco's student-teacher ratio (26 students per teacher) remains the highest in the world.

Observing these data, especially the unfavorable situation of Morocco, raises the following questions that we are going to answer in the following paragraph : 1/ what are the factors that favor school performance in a country, particularly in Morocco ? 2/ why do some countries achieve higher performance than others ? what are the national characteristics that promote these achievements ?

3. Models presentation and results discussion

This paper aims to identify the factors associated with the education system that affect school performance across a sample of MENA countries, focusing on Morocco. Particularly, we estimate the differences in school performance between these countries and assess the effect of national characteristics on the probability of achieving a score of 400 points or more in the TIMSS mathematics test.

Our data are constructed of three hierarchical levels. In addition to the student and school levels, the third level involves countries.

The model has the following form :

$$\log[P_{ijk}/(1 - P_{ijk})] = \beta_{0jk} + \beta_{1jk}X_{ijk} \quad (\text{Level 1})$$

$$\beta_{0jk} = \beta_{00k} + \beta_{01k}Z_{jk} + \mu_{0jk} \quad (\text{Level 2})$$

$$\beta_{1jk} = \beta_{100}$$

$$\beta_{00k} = \beta_{000} + \beta_{001}W_k + u_{00k} \quad (\text{Level 3})$$

$$\beta_{01k} = \beta_{010}$$

Replacing, in the level 1 models, β_{0jk} and β_{1jk} with their values, we obtain the following complete model

$$\log[P_{ijk}/(1 - P_{ijk})] = \beta_{000} + \beta_{100}X_{ijk} + \beta_{010}Z_{jk} + \beta_{001}W_k + u_{00k} + \mu_{0jk}$$

With :

- $P_{ijk} = \Pr(Y_{ijk} = 1)$: the probability that student i from school j in country

- k achieves a score greater than or equal to 400 in mathematics ;
- β_{000} : is the average constant for all countries ;
 - X_{ijk} : the vector of explanatory variables related to the student and his/her family environment ;
 - β_{100} : represents the vector of explanatory variable effects X_{ijk} ;
 - Z_{jk} : the vector of explanatory variables related to school (level 2 variables) ;
 - β_{010} : represents the vector of level 2 explanatory variable effects (Z_{jk}) ;
 - W_k : vector of explanatory variables related to the national context (level 3 variables) ;
 - β_{001} : is the vector of explanatory variable effects in level 3 (W_k) ;
 - μ_{0jk} : is the gap between each institution and the constant (it is a random variable with zero mean and variance σ_μ^2) ;
 - u_{00k} : represents the gap of each country with respect to the constant (it is a random variable with zero mean and variance σ_u^2).

3.1. *Estimating the empty model*

The empty model¹³ estimation enables us to estimate the share of the variance that is due to differences between countries, between schools and between students.

Table 4 : Empty (three-level) model explaining the probability of achieving a score of 400 points or more in mathematics

Fixed effects	
Constant	-0,2646 (0,2087) ***
Random effects	
Constant β_{00k}	2,0424 (0,0771) ***
Constant β_{000}	0,4663 (0,2037) ***
-2LogL	81 610
Number of countries	11
Number of institutions	2 387
Number of students	73 260

*** : significant at the 1% level; (estimated standard deviations are shown in parentheses).

Source : TIMSS, authors' calculations.

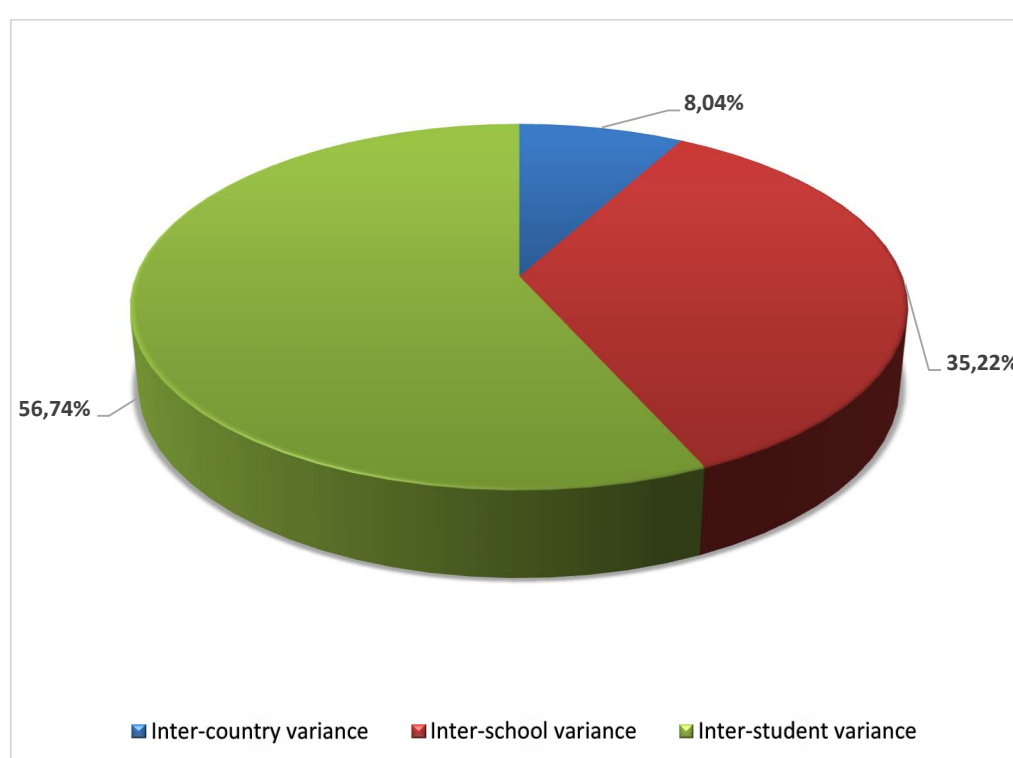
Based on the outputs of Table 4, we find that there is significant variance at

¹³ Also called variance decomposition model

the higher level of the data (country level in our case), which justifies the use of multilevel models to analyze the effects of national characteristics on student academic performance.

Furthermore, our results show that the intra-country correlation coefficient is equal to 0.0804 ($0.4663/0.4663+2.0424+3.29$). Thus, 8.04% of the total variance is due to differences between countries¹⁴.

Graph 2 : Distribution of total variance between data levels



Source: TIMSS, authors' calculations

3.2. *A global model estimation*

After checking the relevance of adopting multilevel models, we will then estimate a global model including all our explanatory variables.

Table 5 : Multilevel models explaining the probability of achieving a score of 400 points or more in mathematics

¹⁴ Abbaia (2018), in a work that focused on the same sample of countries, showed that the share of inter-school variance in the total variance varies between 55% in Lebanon and 27% in Jordan.

Définition des variables	Coefficient	Standard error	Odds-Ratio
Fixed effects			
Constant	18,41***	2,24	
Individual variables			
• Sex of the student (1 if girl 0 if boy)	-0,14***	0,02	0,86
• Age of the student (in years)	-0,47***	0,01	0,62
• Time spent on homework (1 if 45 min or more; 0 if less than 45 min)	0,11***	0,02	1,12
Family variables			
• Use of the language of instruction in the home			
- Rarely or never	Réf.	Réf.	Réf.
- Often	0,19***	0,03	1,21
- Always	-0,02ns	0,02	0,97
• Number of books in the household			
- More than 25	Réf.	Réf.	Réf.
- Between 10 and 25	-0,44***	0,02	0,64
- Between 0 and 10	-0,64***	0,02	0,52
• Highest level of parental education			
- Primary or less	Réf.	Réf.	Réf.
- More than elementary and less than high school	0,25***	0,02	1,29
- High school or more	0,79***	0,02	2,20
School context variables			
• Average household income in the region			
- Low	Réf.	Réf.	Réf.
- Medium	0,41***	0,06	1,51
- High	0,80***	0,11	2,24
• Parent participation in school activities			
- Low	Réf.	Réf.	Réf.
- Medium	0,28***	0,06	1,32
- High	0,82***	0,07	2,28
• Level of discipline and safety in the school			
- Low	Réf.	Réf.	Réf.
- Medium	0,08ns	0,07	1,08ns
- High	0,35***	0,07	1,42
• Availability of computers in the school			
- 1 for every 6 or more students	Réf.	Réf.	Réf.
- 1 for every 3 to 5 students	0,19**	0,07	1,21
- 1 for every 2 students or less	0,17**	0,08	1,18
National variables			
• Mandatory nature of preschool (1 if yes; 0 otherwise)	0,87***	0,12	2,40
• Requirement of a professional qualification examination for teachers (1 if yes; 0 if no)	-2,50***	0,25	0,08
• Autonomy of the schools in the choice of the program (1 if yes; 0 otherwise)	1,55***	0,20	4,75
• Time devoted to mathematics (as a percentage of total teaching time)	0,06*	0,03	1,06
• Student/teacher ratio	-0,13***	0,01	0,87
• Expenditure on education (as a percentage of GDP)	0,48***	0,09	1,63
• Literacy rate	-0,16***	0,01	0,84
Fixed effects	Variance		
Constant (school) β_{00k}	1,468***		

Constant (country) β_{000}	0,013***
-2LogL	76 944
Deviance (from the empty model)	4 666

*ns: not significant; * significant at the 10% threshold; ** significant at the 5% threshold; *** significant at the 1% threshold.*

4. Results discussion

Besides student and family variables and school variables, school system characteristics have a significant effect on students' academic performance.

Our results show that the pupil/teacher ratio, as well as the requirement of a professional qualification examination for teachers, have a significant and negative effect on the probability of achieving a score of 400 points or more in mathematics.

Furthermore, educational expenditure, the amount of time devoted to mathematics teaching, the compulsory nature of pre-school education, and the autonomy of schools in the choice of curriculum have a positive and significant effect on the academic performance of students.

4.1. Compulsory nature of pre-school education

Although pre-school education is available in all the countries in our sample, in some countries compulsory pre-school education has not yet been adopted.

Our results show that students from countries with compulsory pre-school education are more likely to achieve high scores in mathematics than students from other countries. The probability of achieving a score of 400 points or more in mathematics is multiplied by 2.40 for the former compared to the latter.

An education system with compulsory pre-school education ensures good preparation for all students before they enter primary school. In contrast, when pre-school education is not compulsory, only students from wealthy families attend this level of education¹⁵. As a result, a significant proportion of students are doubly penalized. On the one hand, students who do not attend preschool find it difficult to keep up with the learning pace of preschoolers. This leads to an increase in

¹⁵ When it is not compulsory, pre-school education is chargeable in most countries. In Morocco, while several stakeholders (Ministry of Education, local authorities, associations, etc.) have made efforts to provide pre-school education for all children, few students, especially in rural areas, benefit from this cycle before joining primary school.

inequalities between students. On the other hand, the syllabus for the first year of primary school is often inappropriate for students who did not attend preschool. Generally, these programs are designed for students who have acquired the basic knowledge and skills taught in preschool^{16,17}.

4.2. Teacher Qualification Examination Requirement

The estimation results show that students from countries whose education system requires teachers to pass a professional qualification exam are less likely to achieve a high score compared to other students. The probability of achieving a score of 400 points or more in mathematics among the former is increased by 0.08 times compared to the latter.

By requiring teachers to take a professional qualification exam, policymakers seek to ensure that teachers have mastered the skills necessary to practice their profession.

Usually, a teacher's successful completion of the professional qualification exam leads to the teacher's tenure. Thus, it could be said that, after tenure, the teacher no longer makes the effort necessary to provide high-quality instruction.

4.3. School autonomy in the choice of curriculum

The estimation results show that students from countries with school autonomy in curriculum choice are more likely to perform well in mathematics than other students. The probability of achieving a score of 400 points or more in mathematics is increased by a factor of 4.75 for the former compared to the latter.

Thus, the autonomy granted to the school in the choice of curriculum is associated with an increase in the accountability of school managers. With this autonomy in curriculum choice, school officials no longer have the opportunity to justify weak academic performance of their students by the inadequacy of the curriculum to the needs of those students.

Moreover, autonomy in curriculum choice allows schools to take into account

¹⁶ Here we could refer to the prerequisites that non-preschool students lack.

¹⁷ This problem could be solved by giving schools the autonomy to choose programs according to the students' initial level.

the economic, social and cultural characteristics of the region. For example, because rural students spend more time providing support to their parents who work in agriculture, and because of the high rate of parental illiteracy in rural areas, a rural school would have to choose a curriculum that avoids a heavy emphasis on homework.

4.4. Time dedicated to mathematics teaching

Results show that the percentage of time spent on mathematics instruction positively and significantly affects the probability of achieving a high score in mathematics. Increasing the percentage of time spent on mathematics instruction by one point increases the probability of achieving a score of 400 points or more by 6%.

This result is similar to those of Fuchs and Woessmann (2007). These authors showed that the amount of time spent on instruction, measured in minutes per year at the school level, has a positive and significant effect on students' math and science scores.

4.5. Pupil/ teacher ratio ¹⁸

The estimation results reveal that the number of pupils per teacher, measured at the country level, has a negative effect on the probability of achieving a score of 400 points or more in mathematics among students. All else being equal, increasing the student-teacher ratio by one translates into a 13% reduction in the probability of achieving a score of 400 points or more in math.

The pupil/teacher ratio strongly affects the learning conditions of the students. A large class size can weaken the concentration and motivation of students in the classroom. If the teacher is unable to give equal attention to all students in a large class, he or she will focus on the good students and marginalize the weak ones. In addition, in such conditions, the teacher often resorts to lectures. This direct method of teaching¹⁹, characterized by the absence of any interactivity and feedback, is not appropriate for high school students.

On the other hand, large class sizes provide a fertile field for anti-learning

¹⁸ This variable provides information on the effort made by the state in terms of investment in the construction of schools on the one hand, and in the recruitment of teachers on the other.

¹⁹ This is also known as the transmissive model. In this approach to teaching, the student is considered a receiver of knowledge given by the teacher.

practices such as violence and indiscipline²⁰, which requires an extra effort to manage classroom discipline on the part of the teacher. In his review of the literature on empirical work dealing with teacher burnout, Byrne (1999) concluded that a poor classroom climate plays a fundamental role in the emergence of teacher stress²¹.

4.6. Education Expenditures

The findings show that the share of the country's wealth devoted to education spending has a positive and significant effect on the probability of students achieving a score of 400 points or more in mathematics. An increase in the percentage of the country's wealth devoted to education spending by one point results in a 63% improvement in the probability of achieving a score of 400 points or more in math.

Two factors may explain the positive effect of the share of the country's wealth devoted to education spending :

On the one hand, the allocation of the appropriate financial resources to the field of education leads to the improvement of learning conditions among students. Indeed, by bringing schools closer to students²², providing the necessary teaching materials, creating and managing boarding schools and school canteens, public decision-makers guarantee students the conditions to achieve good academic results.

On the other hand, significant financial resources devoted to the remuneration and training of teachers contribute to the improvement of their level of competence and motivation, which has a positive impact on the academic performance of students.

4.7. Literacy rate

Contrary to all intuition, our results show that the higher the literacy rate in the country, the less chance students have of achieving a score of 400 points or more.

This result can be explained by the fact that in oil countries such as Saudi Arabia, Bahrain, Qatar and Oman which have high literacy rates ; 95%, 95%, 96%

²⁰ Martin, Morcillo, and Blin (2004) define undisciplined behavior as violations of order and discipline necessary for the proper conduct of the lesson.

²¹ These are mainly discipline problems, apathy, lack of motivation, lack of effort as well as verbal and physical aggression.

²² In particular, through the creation of schools in rural and isolated areas.

and 87% respectively, the percentage of students who achieved a score of 400 points or more in mathematics did not exceed 45%, 56%, 56% and 39% respectively. In contrast, in countries such as Tunisia and Lebanon where the proportion of students with a score of 400 points or more is 58% and 77% respectively, the literacy rates are only 80% and 90% respectively.

It appears, for example, that in oil-producing countries, educational efforts are much more focused on quantitative than qualitative aspects.

Contrary to all intuition, our results show that the higher the literacy rate in the country, the less likely it is that students will achieve a score of 400 points or more.

This result can be explained by the fact that in oil-producing countries such as Saudi Arabia, Bahrain, Qatar and Oman, which have high literacy rates of 95%, 95%, 96% and 87% respectively, the percentage of students with a score of 400 points or more did not exceed 45%, 56%, 56% and 39% respectively. However, in countries such as Tunisia and Lebanon where the proportion of students with a score of 400 points or more is 58% and 77% respectively, the literacy rates are only 80% and 90% respectively.

It seems, therefore, that in oil-producing countries, efforts in the field of education are much more concentrated on quantitative aspects than on qualitative ones.

Conclusion

This research aims to identify the characteristics of the education system that policymakers can influence in order to improve the academic performance of students in MENA countries and Morocco in particular.

Thus, our analysis took into account variables related to the countries' education systems, such as school autonomy regarding curriculum choice and the compulsory nature of preschool education. To do so, we used the 2011 TIMSS data for the second year of secondary school.

Considering variables belonging to hierarchical levels (students, schools and countries), it was necessary to estimate multilevel models in order to overcome the weaknesses of classical models when using nested data.

The estimation of a three-level empty model, to explain the probability of students achieving a score greater than or equal to 400 points in mathematics, found

that a significant and significant part (8.04%) of the total variance is due to differences between country characteristics. The remainder is related to differences between schools (35.22%) and students (56.74%).

The inclusion of national variables in the model showed that in Morocco, students' academic performance could be improved by granting autonomy to schools in the choice of curricula, making preschool a compulsory education cycle, and increasing the volume of time reserved for mathematics instruction.

In addition, reducing class sizes would contribute to improve the learning and teaching conditions and the academic performance of students.

The results also showed that the requirement of a professional qualification exam for teachers has a negative effect on students' academic performance in mathematics.

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Can CSR engagement improve firm's resilience to the COVID-19 pandemic? Evidence from the Moroccan stock market

Pode o envolvimento na RSE melhorar a resiliência da empresa à pandemia de COVID-19? Dados do mercado bolsista marroquino

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Abstract: The purpose of this paper is to investigate empirically the role of corporate social responsibility engagement on stock returns during the COVID-19 crisis in the case of a sample of Moroccan listed companies. The authors use a difference-in-difference (DiD) regression estimated on a panel dataset of a sample of 23 Moroccan listed companies for the period spanning from March 2019 to March 2021. We identified the connection between CSR activities and financial returns by comparing the monthly stock returns of the treatment and the control groups. Empirical results reveal that the pandemic-induced decrease in stock returns is stronger for firms with CSR activities. It means that engaging in CSR activities does not immunize Moroccan firms during the pandemic. Our findings show that Moroccan's stock market is unable to positively value CSR activities. The results indicate that agency problems lead Moroccan investors to overinvest in costly CSR activities, which reduce the value of the firms in times of the COVID crisis and delay their recovery from it. To the best of our knowledge, this study is the first to investigate the relationship between CSR activities and the resilience of Moroccan companies. Also, this study is distinguished by using the DiD method and by exploiting data from the *Eikon Refinitiv* database.

Keywords: CSR, Resilience, Stock Returns, COVID-19 crisis, Morocco, DiD model.

Resumo: O objetivo deste artigo é investigar empiricamente o papel do envolvimento da responsabilidade social corporativa nos retornos das ações durante a crise da COVID-19 no caso de uma amostra de empresas marroquinas listadas. Os autores usam uma regressão de diferença em diferença (DiD) estimada em um conjunto de dados de painel de uma amostra de 23 empresas marroquinas listadas para o período que vai de março de 2019 a março de 2021. Identificamos a ligação entre as atividades de RSE (Responsabilidade Social das Empresas) e os retornos financeiros, comparando os retornos mensais das ações dos grupos de tratamento e de controlo. Os resultados empíricos revelam que a diminuição induzida pela pandemia nos retornos das ações é mais forte para as empresas com atividades de RSE. Isto significa que o envolvimento em atividades de RSE não imuniza as empresas marroquinas durante a pandemia. As nossas conclusões mostram que o mercado de ações marroquino não consegue valorizar positivamente as atividades de RSE. Os resultados indicam que os problemas de agência levam os investidores marroquinos a investir excessivamente em atividades dispendiosas de RSE, o que reduz o valor das empresas em tempos de crise da COVID e atrasa a sua recuperação da mesma. Tanto quanto é do nosso conhecimento, este estudo é o primeiro a investigar a relação entre as atividades de RSE e a resiliência das empresas marroquinas. Além disso, este estudo distingue-se pela utilização do método DiD e pela exploração de dados da base de dados Eikon Refinitiv.

Palavras-chave: RSE, resiliência, retornos de ações, crise da COVID-19, Marrocos, modelo DiD.

1. Introduction

A growing number of empirical studies have been conducted to determine whether corporate social responsibility (CRS¹) and environmental, social and governance (ESG²) enhance or harm the firms' value, but their findings are still debatable. Some studies have shown that ESG activities are solely motivated by the managers' self-interested behaviors thus impacting negatively the firm's value (Brammer et al., 2006), while others have demonstrated the value-enhancing effect of ESG activities on the firms' value and reputation (Lins et al., 2017; Edmans, 2011). During the financial crisis scholars have found that ESG activities have a slow-release effect on systematic risk (Albuquerque et al., 2019). Firms

1 The Corporate Social Responsibility can be defined as the voluntary integration by companies of social and environmental concerns into their commercial activities and their relationships with stakeholders.

2 This acronym refers to the environmental, social and governance criteria used to assess and analyze how a company's strategy takes into account sustainable development and long-term issues.

with good ESG practices have strong resilience to shocks and have the ability to recover faster from external shocks (Benabou & Tirole, 2010).

But unlike the financial crisis of 2007–2008, the covid-19 crisis offers a unique perspective to investigate the CSR resiliency hypothesis. Currently, there is no information regarding how pandemics impact financial markets (Goodell, 2020). Nothing analogous has ever happened other than the 1918 Spanish flu pandemic in the distant past, therefore comparisons to natural disasters may only be made in the most general terms. Scholars and practitioners alike began investigating the buffer effect of ESG engagements on the company's stock performance during the pandemic and whether they contribute to the firms' resilience and fast recovery (Albuquerque et al., 2020; Ding et al., 2020).

In this study, we analyze the connection between ESG engagement and stock performance amid the COVID-19 crisis by investigating the influence of ESG engagement on the stock returns of publicly traded companies in Casablanca's stock exchange. The Moroccan stock market offers a unique perspective to re-examine the nature of the relationship as it the Moroccan stock exchange gives a different angle than that of developed countries. Furthermore, large state or family-owned conglomerates make up the lion's share of the stock market capitalization. Therefore, Moroccan traded companies suffer from a severe agency problem due to the state ownership and information ambiguity as a consequence of family-owned businesses (Piotroski et al., 2015; Jiang & Kim, 2020).

The remainder of the study proceeds as follows. In section 2 we provide a review of the related literature. Section 3 presents the data and the methodology used in the study. Section 4 presents and discusses the main results. Section 5 concludes.

2. Theoretical background

2.1. CSR and ESG activities

According to the European Commission's Green paper, CSR can be defined as "a voluntary commitment, which consists in integrating economic, social and environmental objectives in the production process and in the relationship with external and internal stakeholders and that which is required by law" (European

Commission, 2001). Based on this definition commercial, financial and industrial companies alike are not only responsible to the internal stakeholders (shareholders and debtholders) but also the broad scope of external stakeholders such as customers, suppliers and civil society. And while companies are defined as a corporate citizen from a CSR point of view, because it only focuses on the relationship of the company with its stakeholders, an ESG perspective incorporates other non-financial aspects. In other words, ESG is a broader concept than CSR, taking into consideration a wider spectrum of social values, namely sustainable development and green finance (Gillan et al., 2021). But why do companies pursue CSR and ESG activities?

The answer can be given through stakeholder and legitimacy theories. According to the first theory, firms are not isolated entities from the rest of society, and the firms' actions have an impact on the wider range of its stakeholders, the society and the environment as a whole. Thus, firms can not only rely on profit maximization logic but should seek sustainable management (Freeman, 1984). The second theory gives an institutional perspective to why should firms adopt ESG and CRS activities. While pursuing these activities can be costly in the short run but helps to legitimize the firm's reputation and credibility among investors and creditors which can be rewarding in the long run. A legitimate firm can easily secure the necessary funds and resources vital to the firm's growth and performance (Deegan & Unerman, 2011). But this being said how do the CRS and ESG activities impact the firm's value and performance?

2.2. CRS and the firm value

A growing number of empirical literature have attempted to clarify the relationship between CSR activities on one hand and the firm's value on the other but with mixed results showing either a positive relationship (Lins et al., 2017; Phang et al., 2023), a negative relationship (Di-Guili & Kostovetsky, 2014) or neutral (Bae et al., 2021). From this empirical literature, two opposite hypotheses have emerged to try to explain the nature of the relationship. An overinvestment hypothesis based on the agency and neoclassical theory, and a conflict resolution hypothesis based on the stakeholder theory.

2.2.1. The negative view

The overinvesting hypothesis suggests that engaging in CRS activities is solely motivated by the manager's self-interested behaviors (Cespa & Cestone, 2007). Managers tend to increase their reputation and persona as good and engaged citizens (Bardy & Ruben, 2010). Furthermore, according to Cespa & Cestone (2007) engaging in CSR practices is a good strategy for CEOs to maintain their positions. With this in mind, managers tend to increase their CSR engagement and overinvest beyond an optimal level, reducing the firms' value. Moreover, a wide range of empirical studies show that insiders' holdings are unfavorable to the firms' CRS activities, implying that overinvesting in CRS activities is partly due to the agency problem (Lin et al., 2021; Kruger, 2015).

Following the neoclassical theory, the sole purpose of the firm is to maximize the shareholders' wealth. Friedman (1970) views the CSR engagement as a donation from shareholders to the stakeholders which can lead to a competitive disadvantage compared to unengaged companies. According to Friedman, it's not up to managers to donate on behalf of shareholders, and if shareholders wish to donate it should be from their own income. According to stockholders' theory, resources should be allocated to improving the profitability and wealth of shareholders. Any resources directed toward stakeholders decrease the firm's value.

2.2.2. The positive view

According to Freeman (1984), the conflict resolution hypothesis (or reputation-building hypothesis) states that CSR activities have a positive impact on firms' value "*doing well by doing good*". According to the stakeholder theory, CRS activities help to mitigate conflicts between internal and external stakeholders, improve the firm's communication with its environment and reduce conflict of interest between managers and stakeholders by improving firm's reputation. CSR can also be used to strengthen the company's branding allowing product differentiation, boosting the company's margins and reducing the information asymmetry which diminishes the risk (Albuquerque et al., 2019). Empirical studies demonstrate that CRS reduces firm's information asymmetry and thus lowers the risk premium benefitting the company from lower capital cost (Cui et al., 2016; El Ghouli et al., 2011). Based on the above discussion CSR allow to benefit from a positive valuation effect.

2.3. The CSR and the firm's performance

To date, researchers have not reached the same conclusions about the effect of CSR activities and financial performance. Some studies have shown a positive correlation, others a negative correlation, and still others no correlation.

Numerous studies have shown a positive impact of CSR activities on the firm's financial performance. Orlitzky (2001) showed that when firm size is taken as a control variable, CSR is found to be positively associated with financial performance. Simpson & Kohers (2002) investigated the relationship between CSR and financial performance in the banking sector, and the results confirm the positive connection between the two. Luo & Bhattacharya (2006) demonstrate that CSR activities allow for better financial performance in the long term. In the same way, Surroca et al. (2010) found that the formation of intangible assets impacts positively the firm's financial performance. In the same vein, Shen & Chang (2009), by relying on four matching methods, established that CSR is positively related with firms' profit margin, net sales, and pre-tax income. Pan et al. (2014) studied the relationship between CSR and financial performance in the mining industry in China and established that CSR is positively linked with financial performance. Aboud & Diab (2018) also found that ESG activities that satisfy stakeholders' interests improve financial performance. Moreover, Kang & Jung (2020) establish that ESG activities don't impact equivocally the firms' financial performance, but it depends on the firms' financial characteristics.

On the other hand, other research findings confirm the positive impact of CSR on financial performance. Using a UK corporate reputation index, Brammer et al. (2006) found a negative impact of CSR on firms' stock returns. Based on a cross-country analysis, Surroca & Tribó (2008) highlighted a negative relationship between firms' financial results and their social performance. Similarly, the work of Makni et al. (2009) identifies a strong negative impact of the environmental dimension on financial performance. The same results were found by Duque-Grisales & Aguilera-Caracuel (2021) in the case of Latin American companies.

2.4. ESG and financial performance during the crisis

Various studies had been conducted to study the effect of ESG activities during the financial crisis. A part of them demonstrated the positive impact of ESG activities on the firms' financial performance during the period of crisis. Cornett et al. (2016) establish that banks with high quality CSR activities had a higher financial performance during and after the financial crisis. Lins et al. (2017) stress that CSR activities during the crisis are associated with higher stock returns, and high-CRS rated firms had higher profitability and rapid growth during the same period. Krueger et al. (2021) found that firms with higher ESG performance are less sensitive or more resilient and recover rapidly from the aftermath of the crisis. Oikonomou et al. (2012) come to the conclusion that CRS activities were negatively correlated with financial risk.

According to Broadstock et al. (2021), in their analysis during the COVID-19 crisis, firms with high ESG scores performed better than those with low ESG scores. The event study method was used to demonstrate that ESG did, to some extent, play a key role in avoiding risk during times of crisis as opposed to times of prosperity. Using the difference in differences method to measure the moderation effect of ESG activities on firms' risk during the crisis, Albuquerque et al. (2021) demonstrated that firms with poor ESG performance showed a downside risk that is significantly greater than that of firms with excellent ESG performance. Furthermore, Diaz et al.(2021) found that the environment and society are the two key factors that can indicate the importance of risk avoidance during the COVID-19 crisis. Yamada & Takahashi (2021) determine the elements that influenced the Japanese stock market during the COVID-19 epidemic. There is no evidence that companies with high ESG scores have greater abnormal returns, but those with ESG funds do better than those without. Table I below summarizes the results of some recent studies regarding the relationship between ESG practices and firms' value.

Table 1: Summary of empirical studies on the relationship between ESG engagement and firms' value

Study	Market scope	Relationship between	CRS → company's performance	Methodology
Tian et al. (2022)	Chinese stock market	Companies' characteristics and stock returns	Negative impact on stock return	Difference in differences
Abedifar et al. (2021)	Canada, France, Japan, the UK and the US.	Companies' characteristics and stock returns	Mixed results depend on the country	Accounting-Based Analysis
Lee et al. (2022)	Korean stock exchange	Investors type and stock returns	Positive impact on stock returns Investors liquidate lower ESG engagement companies	Event study
Yi et al. (2022)	Chinese stock exchange	Companies' characteristics and stock returns	Negative impact due to agency	Difference in differences
Qiu et al. (2021)	Chinese stock exchange	Companies' characteristics and stock returns	investors positively react to pandemic-related CSR activities	Difference in differences and event study
Mousa et al. (2021)	Arab countries	Arab stock market indexes	Positive impact on stock returns and the firms value	GARCH model
Zhou & Zhou (2021)	Chinese stock market	TobinQ, companies' characteristics and stock returns	ESG engagement has a cushion effect, lowers volatility and stronger recovery	Difference in differences
Hafez (2016)	Egyptian stock exchange	Companies' characteristics and stock returns	Significant positive relationship between CRS and stock performance	multiple linear regression
Cardillo et al. (2022)	European countries	ESG ration and death cases	ESG improves stock performance	panel data regressions
Bonnie et al. (2017)	American stock exchange	TobinQ, companies characteristics and stock returns	CSR firms has a higher firm value than non-CSR	Difference in differences
Hwang et al. (2021)	Korean stock exchange	Companies' characteristics and stock returns	ESG activities protect firms from a sharp decline in financial performance	Difference in differences
D'Amato & Falivena (2020)	European stock exchange	KLD TobinQ, companies' characteristics and stock returns	CSR affects firm value differently, depending on company size and age	Panel model
Hu et al. (2018)	Chinese stock exchange	TobinQ, companies' characteristics and stock returns	Neutral impact	Multiple linear regression
Engelhardt et al. (2021)	European stock exchange	Companies' characteristics and stock returns	higher ESG ratings firms perform significantly better during the crisis	ordinary least squares (OLS) regression

Source: Authors

In summary, current research offers ambiguous conclusions on the connection between companies' CSR or ESG engagement and stock returns during the COVID-19 crisis. Hence, we formulate the following alternative hypotheses:

Hypothesis H1a: Listed Moroccan firms with ESG engagement have higher stock returns amid the COVID-19 crisis than firms without ESG engagement.

Hypothesis H1b: Listed Moroccan firms with ESG engagement have lower stock returns amid the COVID-19 crisis than firms without ESG engagement.

Hypothesis H1c: Listed Moroccan firms with ESG engagement have stock returns comparable to those of firms without ESG engagement, during the COVID-19 crisis.

3. Data and methodology

3.1. Data

Our sample is made up of 23 listed companies in Casablanca's stock exchange between the period of March 2019 and March 2021. We begin with our treatment group which includes the ten companies of the ESG10 index. These companies are considered to be a treatment group, as they adhere to CSR activities from the point of view of the ESG10 index. For the control group, we are going to choose the other remaining companies listed in the MSI20 that are not included in the ESG10 index, i.e. companies that do not engage in CSR activities as defined by the ESG10 index. The choice of control group is largely dictated by data availability. Our sample of firms covers 83% of the total transactions in Casablanca's stock exchange. We extract data about the corporate financials and stock returns from *Eikon Refinitiv* database.

3.2. The model

In impact evaluation studies, one of the most used techniques is Difference-in-Differences. The approach, which combines before-and-after and treatment-control group comparisons, is intuitive and has been applied extensively in a variety of fields, including management, public policy, economics, and health research. The basic idea behind DiD models is that observations are collected for two groups of individuals. One group is the treatment group, which is exposed to

the treatment. The other is the control group, which receives no treatment. In the absence of treatment, the treatment and control groups should in principle follow the same trend over time. This is known as the parallel trend hypothesis. The DiD model makes it possible to assess the effect of implementing a policy by comparing the differences between the treatment and control groups before and after the policy has been implemented³.

Following Tian et al. (2022), first we employ a difference-in-difference model, which is used to investigate the impact of a policy or an exogenous event, to determine the causal relationship between CSR and stock returns during the covid-19 crisis in Morocco.

In order to compare the monthly stock returns of the control and treated groups, we use an event window of $[-12, +12]$, from March 2019 to March 2021, and estimate the following difference-in-difference regression:

$$Y_{it} = \alpha_0 + \alpha_j D_{it} + \gamma_j Z_{it} + u_i + \lambda_i + \varepsilon_{it} \quad (1)$$

The dependent variable Y_{it} is the monthly stock return adjusted by dividend which is used to determine the firm's performance while we use the monthly abnormal stock return adjusted by dividend to check the robustness of the results. Whereas the independent variable D_{it} is the treatment dummy that takes 1 if the firm belongs to the control group and to a post-covid-19 period; otherwise, it is zero. The typical treatment effect is static. We consider the lockdown on March, 2020, as an exogenous shock.

Based on the relevant literature like Clarkson et al., 2008, 2019; Lins et al., 2017; Chen et al., 2018; Zhang et al., 2020 ; Li et al., 2020 ; Ting, 2021; Albuquerque et al. (2020),_Poursoleyman et al, 2023, the Z_{it} matrix is a set of firms' characteristics used as control's variables. The reason is that these variables have been shown to influence stock returns and play a decisive role in the relationship between CSR and company performance. Firms' volatility is the stock's logarithmic rate of return over the past 250 trading days. Ownership is a

³ Like all quasi-experimental methods, the Difference-in-Differences approach measures the effect of a treatment on the treated group. However, it does not measure the effect it would have if generalized to the entire population, nor does it capture variations in effects among different treated individuals.

dummy variable that takes 1 if the majority shareholder is a foreign investor; otherwise, it is 0. Other control variables are based on accounting data. *Lev* is the total liabilities divided total assets. The operating cash flow to total assets ratio is used to determine *cash flow*. *ROA* is defined as the net asset to total asset ratio. *Size* is the natural logarithm of the book value of the entire assets. *BM* is the market-to-book ratio.

Second, we employ a staggered difference in difference model (dynamic DiD) to verify the pre-treatment parallel trends hypothesis:

$$Y_{it} = \alpha_0 + \sum_l \alpha_l D_{it} + \gamma_j Z_{it} + u_i + \lambda_i + \varepsilon_{it} \quad (2)$$

Where D_{it} is a series of dummies variable indexed by firm and the month relative to the covid-19 outbreak in March 2022. If no significant difference between the treated and non-treated firms occurs, therefore we assume that the parallel trend hypothesis is verified as there is no treatment effect. We use a TWFE regression model and an alternative model proposed by Sun & Abraham (2021) to test the parallel trend assumptions.

3.3. Results and discussion

3.3.1. Results of the main regression

Table II provides a summary of the key regression. The second and third columns of table II's first row employ monthly returns as their dependent variable. The average treatment effect is still statistically significant at 1% in the second column, whereas the first column simply includes additional control variables for the company and time fixed-effects. The empirical data shows that, during the COVID-19 pandemic, CSR had a considerable negative impact on stock returns. The financial performance of both control and treatment groups was negatively and significantly affected by COVID-19. However, these effects were more pronounced for the treatment group than for the control group. The average monthly returns of corporations with CSR engagement are -1.367 percent lower than those of their competitors. By using the monthly abnormal return rate, the first and third Columns show that the average treatment effects are still significant. Thus, our results are consistent with the shareholder's theory (Friedman, 1970).

Table 2: The effects of ESG engagement on stock return according to diff and diff regression

	Dependent variable			
	Abnormal return (1)	Normal return (2)	Abnormal return (3)	Normal Return (4)
Dit	-0.567* (0.309)	-1.367*** (0.371)	- 0.773* (0.456)	-1.423*** (0.468)
ROA	-0.019 (0.091)	0.008 (0.092)		
Lev	-1.585 (0.756)	-1.703** (0.800)		
Volm	-15.272 (13.464)	-13.570 (12.568)		
BM	-1.934*** (0.172)	-2.044*** (0.170)		
Cashflow	-0.597 (1.080)	-0.522 (1.100)		
Size	-0.089 (0.136)	-0.143 (0.136)		
Ownership	-0.780** (0.375)	-0.705 (0.382)		
Constant	2.094** (2.643)	1.950** (0.892)	0.446 (0.317)	0.592** (0.316)
Observations	552	552	552	552
R2	0.027	0.019	0.002	0.005
Adj R²	0.012	0.005	0.001	0.003
Residual Std. Error	6.297 (df = 543)	8.010 (df = 543)	6.335 (df = 549)	8.017 (df = 549)
F-Statistic	1.859* (df = 8;543)	1342 (df = 8; 543)	1.295 (df = 2;549)	2.736 (df = 549)

Note: *, **, *** represent the significance at 1%, 5% and 10% respectively.

Source: Authors

Furthermore, according to the agency theory, which argues that agency issues drive managers to overinvest in pricey CSR initiatives for their own purposes, CSR had a detrimental influence on stock returns during the crisis. Overinvestment may have put businesses in poor financial conditions when the COVID-19 pandemic unexpectedly occurred, which limits businesses' ability to operate during the crisis and recover from it. Investors respond more harshly to companies with CSR activities because they anticipate these repercussions (Johnson et al., 2000).

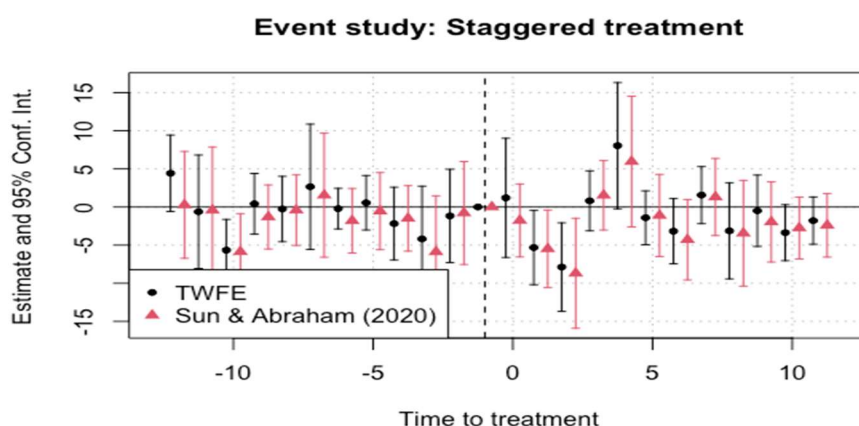
A significant drop in asset value during the crisis makes agency issues more acute, leading to extensive credit rationing and significant reductions in all sorts of investments (Bernanke et al., 1999). Almeida et al. (2012) uncover empirical

proof of the sharp decline in business investment that followed the start of the 2008 financial crisis. Therefore, without adequate supervision, the costs of CSR overinvestment during a financial crisis, when financial resources become more precious, can outweigh the benefits of conflict resolution. In other words, the deployment of CSR programs wastes valuable firm resources and causes a decline in firm value during the crisis without adequate monitoring and external corporate control. Thus, negatively impacting the firm's value and stock performance. According to our results, CSR performance does not increase corporate resilience to COVID-19 exogenous shock.

3.3.2. Results of the dynamic regression

This section looks at how CSR changed both before and after COVID-19. Using a dynamic difference in differences regression, we then explore the dynamic impacts of ESG engagement pre and after the COVID-19 crisis. Figure I shows the dynamic effects of CSR together with associated confidence intervals by using a TWFE model and Sun and Abraham (2021) correction. The two regressions show that the pre-treatment coefficients are statistically insignificant, demonstrating that there is no significant treatment effect between the treatment and control group thus suggesting that the parallel trend hypothesis holds for our case. In contrast, their stock returns dramatically diverge after the incident, and the differences last for 5 months before they converge once again after the 5th month.

Figure 1: The dynamic effect of CSR on stock return



Source: Authors via R

The results demonstrate that Moroccan's stock market is unable to positively value CSR activities. This finding is not in line with the resiliency hypothesis involving that firms that engage in CSR activities are more resilient in periods of crisis. Some explanation may confirm this result. The first one stems from the agency theory which implies that Moroccan managers, who are motivated by their self-interest, tend to overinvest in costly CSR activities. As a result, the stock market returns of companies decline during the pandemic. The second one is that the CSR practices are part of a long-run strategy; hence they can only have a positive long-run impact on a company's financial performance. Thus, the effect is non-linear, initially negative (cost of CSR activities), and then reverses from a certain level or in the long-run, which finally improves stock returns. A third possible explanation is that Morocco is a small emerging economy that has not yet reached the stage of development where CSR practices will be appreciated. Ding et al. (2021) showed that CSR activities enhance firm resilience in economies that value them highly and where social norms place a high value on the human rights and the environment. In these economies, CSR is more likely to boost loyalty and improve stakeholder relations.

Our findings are inconsistent with studies of Ding et al. (2021) and Albuquerque et al. (2020), Broadstock et al. (2021) and Phang et al. (2023) who claimed a positive impact of CSR activities on stock returns. However, they are in line with the results of Tian et al. (2022), Yi et al. (2022), and Nirino et al. (2022) who established that CSR activities worsen the stock performance of Chinese firms. Indeed, this study contributes to the intense debate on the role of CSR activities in firm resilience.

3.3.3. Robustness checks

The crucial assumption of DiD models is the presence of parallel trends. Violation of this assumption is likely to bias the identification of the causal effect of a treatment. We use a TWFE regression model and an alternative model proposed by Sun & Abraham (2021) to test the parallel trend assumptions. The two estimated regressions showed that the pre-treatment coefficients are statistically insignificant, suggesting that the parallel trend hypothesis holds for

our case. This is also confirmed with the introduction of exogenous control variables⁴.

4. Conclusion

By the end of February 2020, an exogenous shock caused by the COVID-19 pandemic triggered the fastest stock market decline in history. We exploit this unprecedented period to study the influence of CSR activities on the financial performance of listed Moroccan firms during this crisis. The unpredictable nature of this event provides the researcher with an interesting opportunity because firms did not have enough time to react and, as a result, their resilience depends solely on their previous strategic decisions. We reveal that the pandemic-caused decline in stock returns is more pronounced for companies that engage in CSR activities. It means that engaging in CSR activities does not immunize Moroccan firms during the pandemic. This result is not consistent with the resiliency hypothesis which states that companies that engage in CSR practices are more resilient in times of crisis. So, Moroccan's stock market is unable to positively value CSR activities.

A possible explanation for this result relates to the agency problem. According to agency theory, Moroccan managers, guided by their own self-interest, tend to overinvest in costly CSR activities, which has hurt the stock market performance of Moroccan companies during the COVID crisis and impeded their recovery afterward. This can also be explained by the non-linear effect of investment in CSR activities on financial performance and by the fact that these practices are relatively recent in Morocco so that they are not yet appropriated by investors.

Although CSR activities are detrimental to companies' financial performance, this impact is likely to be reversed as these activities become more visible and developed. Managers therefore need to become more involved in CSR activities, strengthen the quality of responsible investment and raise investor awareness of the importance of these activities.

⁴ To reinforce the robustness of the results, we can also use a placebo test by replacing the control group with another similar control group. But unfortunately, lack of data prevented us from carrying out such a test.

The study has focused only on listed firms. It would be more interesting to expand the sample to unlisted companies in future research in order to get a complete picture of the connection between CSR activities and the performance of Moroccan firms.

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**Les déterminants de structure de capital
des compagnies marocaines d'assurances :
Une estimation par la méthode
des moments généralisés en système**

**The determinants of capital structure of Moroccan insurance
companies: An estimation by the method of generalized
moments in system**

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Résumé : Ce travail de recherche, cherche à répondre à la question suivante : quels sont les déterminants de la structure de capital des compagnies marocaines d'assurances ? Pour se faire nous avons mené une étude empirique en utilisant des techniques économétriques originales, notamment l'estimateur des moments généralisés et des tests statistiques appliqués en fonction des hypothèses d'homogénéité et de stationnarité des variables utilisées sur une population composée de 17 compagnies d'assurances marocaines, au cours de la période 2011-2019. Les résultats de notre modèle empirique ont révélé que le taux de rentabilité significativement négatif sur la structure du capital des compagnies d'assurances marocaines. Contrairement à la rentabilité, l'impact de la tangibilité est significativement positif. Sur la base des résultats du GMM, l'étude a montré un effet négatif insignifiant de la croissance sur structure du capital des assureurs marocains. Pour ce qui est de la taille, de la liquidité et du risque, celles-ci ont un impact significativement positif sur le ratio d'endettement, tandis que l'étude a trouvé que la variable provisions techniques a un effet positif mais statistiquement non significatif sur la structure de capital des compagnies d'assurances marocaines. Cette étude conclut que la rentabilité, la taille, la tangibilité, la liquidité et le risque sont des déterminants de structure de capital des compagnies marocaines d'assurances.

Mots clés : structure de capital, méthode des moments généralisés, assurance, impact.

Abstract: This research seeks to answer the following question: what are the determinants of the capital structure of Moroccan insurance companies? To do so, we conducted an empirical study using original econometric techniques, notably the generalized moments estimator and statistical tests applied under the assumptions of homogeneity and stationarity of the variables used on a population composed of 17 Moroccan insurance companies, over the period 2011-2019. The results of our empirical model revealed that the rate of return has a significantly negative impact on the capital structure of Moroccan insurance companies. In contrast to profitability, the impact of tangibility is significantly positive. Based on the GMM results, the study showed an insignificant negative effect of growth on the capital structure of Moroccan insurers. As for size, liquidity and risk, these have a significantly positive impact on the leverage ratio, while the study found that the technical provisions variable has a positive but statistically insignificant effect on the capital structure of Moroccan insurance companies. This study concludes that profitability, size, tangibility, liquidity and risk are determinants of the capital structure of Moroccan insurance companies.

Keywords: capital structure, generalized method of moments, insurance, impact.

1) Introduction

Les politiques de structure du capital sont vitales pour les entreprises en raison de la nécessité de maximiser le taux de rendement des différentes parties prenantes de la société et aussi à cause de l'impact de celles-ci sur la capacité d'une entreprise à s'adapter à son environnement concurrentiel devant être pris en considération dans la décision sur la structure de capital. C'est pour cette raison que les décideurs doivent être appelés à mettre en place une combinaison appropriée de financement interne et externe.

Le point de départ de tous les travaux sur la théorie de la structure du capital réside dans l'article novateur de Modigliani et Miller en 1958 où ils ont soutenu que l'impact du financement n'est pas d'une grande importance sur la performance financière de la firme tout en affirmant que lorsque la valeur de l'entreprise dépend de sa structure du capital, on peut se retrouver dans une situation d'arbitrage sur le marché financier.

La question de la structure du capital est primordiale dans toutes les organisations, financières ou non financières. Et l'industrie de l'assurance ne fait pas exception à la règle, bien que la vocation principale de cette dernière soit différente, et qui consiste dans l'indemnisation et la protection des individus et des entreprises, contre les préjudices pouvant être causés en cas de réalisation d'un sinistre éventuel. C'est

pourquoi les compagnies d'assurance s'intéressent toujours à leur solvabilité et à leur liquidité. Afin de contrôler les risques, les compagnies d'assurance suivent une méthode efficace et appropriée lorsqu'elles examinent le montant de capital nécessaire pour réduire les pertes soudaines dues aux sinistres et aux autres expositions au risque opérationnel.

Le marché marocain des assurances, et suite aux différentes défaillances qu'a connues ce marché durant les années 90, qui ont causé la liquidation de cinq sociétés d'assurances¹ à cause, principalement, des défauts de gestion, notamment des sous-évaluations des provisions techniques, le non-paiement des primes, des fraudes...etc, s'est engagé dans une série de réforme en adoptant une approche préventive via la mise en place d'une réglementation stricte en matière de la constitution de la marge de solvabilité, des provisions techniques et des placements. Cette norme a connu plusieurs modifications permettant ainsi de renforcer le contrôle préventif de ce secteur par l'Autorité de Contrôle des Assurances de la Prévoyance Sociale (ACAPS). Cette instance fut créée en 2016, en remplacement de la Direction des Assurances et de la Prévoyance Sociale qui relevait du Ministère de l'Économie et des Finances.

A partir de ce qui précède, et en se basant sur des concepts analytiques à travers l'analyse des compagnies d'assurance, cette étude aura pour objectif de répondre à la problématique suivante : quels sont les déterminants de la structure de capital des compagnies marocaines d'assurances ?

Pour répondre à cette problématique, nous avons mené une étude empirique en utilisant des techniques économétriques originales, notamment l'estimateur des moments généralisés et des tests statistiques appliqués en fonction des hypothèses d'homogénéité et de stationnarité des variables utilisées sur une population composée de 17 compagnies d'assurances marocaines, au cours de la période 2011-2019.

En effet, le présent travail de recherche apporte plusieurs contributions. Premièrement, il existe une panoplie d'études au Maroc ayant traité les déterminants de la structure du capital des sociétés non financières, mais à notre connaissance, aucune étude n'a abordé la question des déterminants de la structure

¹Dotation en capital des assureurs non-vie : trouver le bon usage entre la sécurité et la rentabilité, Suiss Re, Sigma n°1/2000

du capital des compagnies d'assurance marocaines. Deuxièmement, l'étude comble une lacune importante dans la compréhension des décisions relatives à la structure du capital des compagnies marocaines d'assurance.

Dans ce qui suit nous présenteront les points suivants : en premier lieu, il est important de donner un cadrage théorique des théories mobilisées pour répondre à notre question centrale. Ensuite, nous présenterons la méthodologie adoptée dans le présent travail de recherche, pour dans un cinquième point mettre en lumière les résultats obtenus. Et enfin, procéder à une présentation des différentes conclusions.

2) Revue de littérature

L'étude de la structure du capital est l'une des questions les plus controversées. Le premier jalon sur celle-ci a été posé par les pionniers Franco Modigliani et Merton Miller en 1958, qui ont développé un modèle s'appuyant sur la non-pertinence de la structure du capital pour la détermination de la valeur et les performances futures des entreprises. A cet effet, ils ont examiné l'impact des variables spécifiques sur la relation entre la structure du capital et la valeur de l'entreprise, tout en proposant le recours à l'endettement pour une augmentation de la valeur de l'entreprise.

Les travaux fondateurs de Modigliani et Miller² ont fourni aux chercheurs des pistes et des lignes directrices permettant ainsi l'élargissement du cadre théorique dans lequel diverses théories ont vu le jour. Plusieurs théories ont été élaborées depuis lors, suggérant plusieurs facteurs susceptibles de déterminer la décision d'une entreprise en matière de structure du capital (Abeywardhana, D., 2017).

2.1. Les théories de structure de capital

Depuis la publication de Modigliani et Miller (1958) sur la théorie de non-pertinence de la structure du capital, la théorie de la structure de capital a fait l'objet de plusieurs recherches donnant, ainsi, l'apparition de nouvelles théories qui

² Parmi les études effectuées sur le théorème de Modigliani et Miller, on cite Shyam-Sunder, L. et Myers, S. (1999), Fama, E. et French, K. (2002), Welch, I. (2004) et Leary, M. et Roberts, L. (2005, 2010).

divergent de celle de Modigliani et Miller et qui affirment l'influence de la structure du capital sur la valeur de l'entreprise. Les théories les plus importantes sur la structure de capital seront présentées ci-dessous.

2.1.1. Théorie du compromis

La théorie du compromis repose sur l'hypothèse que les entreprises poursuivent une combinaison financière cible optimale qui compense les avantages marginaux et les coûts marginaux de l'effet de levier (Dhaene J. et al, 2015).

Dhaene J. et al (2015) considèrent que le point de départ de la théorie du compromis est la logique de Miller et Modigliani (1958) qui sépare les décisions d'investissement et de financement, en prenant les décisions d'investissement d'une entreprise comme étant prédéterminées, et que la structure du capital est déterminée plus tard, d'autant plus que la valeur totale de l'entreprise³ ne change pas en fonction de la structure du capital.

Pour Leary, M. et Roberts, M. (2005), la théorie du compromis postule que les entreprises ont un ratio d'endettement optimal ou cible qui équilibre parfaitement les coûts et les avantages du financement par emprunt.

2.1.2. Théorie de l'ordre hiérarchique

La théorie de l'ordre hiérarchique a été introduite pour la première fois par Donaldson, G. (1961) dans le cadre d'une étude sur les entreprises américaines, et modifiée par Myers, S et Majluf, N. en 1984. Selon cette théorie, les méthodes utilisées pour financer une entreprise sont les fonds propres, l'endettement et l'émission de nouveaux capitaux propres sans l'existence d'une structure de capital optimale (Myers, 1984), avec une préférence des fonds propres, vu qu'ils n'impliquent pas de coûts de mise en bourse, et qu'ils permettent d'éviter que les informations de l'entreprise ne soient utilisées par d'autres entreprises pour prévenir que celle-ci ne perde son avantage comparatif (Liesz, T. 2001).

³ Il s'agit de la valeur marchande totale des titres (actions et titres de créances).

Selon Myers, S. et Majluf, N. (1984), la structure du capital d'une entreprise peut contribuer à atténuer les inefficacités du plan d'investissement d'une entreprise, qui sont causées par l'asymétrie d'information, et le fait que les gestionnaires devront suivre un ordre de préférence, en utilisant les fonds internes en premier lieu, puis les dettes à risque, et enfin en recourant aux capitaux propres. De plus, ils ajoutent qu'en l'absence d'opportunités d'investissement, les entreprises devront conserver leurs bénéfices et accumuler une marge de manœuvre financière pour éviter d'avoir à lever des fonds externes à l'avenir.

2.1.3. Théorie de l'agence

La théorie de l'agence considère qu'il existe un niveau d'endettement optimal dans la structure du capital permettant de minimiser les coûts d'agence. Diverses méthodes ont été proposées pour atténuer les problèmes d'agence. Jensen et Meckling (1976) suggèrent d'augmenter la participation des dirigeants dans l'entreprise afin d'aligner les intérêts des dirigeants avec ceux des propriétaires, ou d'accroître le recours à l'endettement qui réduira la base de fonds propres et augmentera le pourcentage de fonds propres détenu par les dirigeants (Grossman et Hart, 1982).

2.1.4. Théorie du signal

La théorie de signal, développée en 1977 par Stephen Ross⁴, suppose que les dirigeants de l'entreprise sont censés avoir une meilleure connaissance de la rentabilité future de celle-ci, et qu'un niveau élevé d'endettement sera perçu par les investisseurs comme un signal de la stabilité actuelle des revenus de l'entreprise, de l'importance de ces derniers dans le futur et, par conséquent, de la confiance des dirigeants dans la performance de leur entreprise⁵.

⁴ Le concept du signal a été étudié pour la première fois dans le contexte des marchés de l'emploi et des produits par Akerlof et Arrow, et a été développé en une théorie de l'équilibre par Spence. (Ross, S. 1977)

⁵ Une approche équivalente consiste à supposer que les gestionnaires peuvent s'engager à verser des dividendes et subir une pénalité si le dividende promis n'est pas versé. Ravid, A. et Sarig, O. (1989) envisagent une combinaison de dette et d'engagement de dividende, ils montrent que le niveau des dividendes et de la dette augmente avec la qualité de l'entreprise.

Dans ce sens, Ross, S. (1977) suppose que les dirigeants connaissent la valeur exacte de l'entreprise à la différence des investisseurs qui, selon lui, interprètent des niveaux d'endettement élevé comme un signal de meilleure qualité de la firme.

2.1.5. Théorie du market timing

Récemment, Baker, M. et Wurgler, J. (2002) ont proposé la théorie du market timing qui postule que la structure actuelle du capital est le résultat cumulé des tentatives passées de chronométrage du marché des actions. Cette théorie consiste à ce que les entreprises émettent de nouvelles actions, lorsqu'elles se rendent compte qu'elles sont surévaluées, et en rachetant leurs propres actions lorsqu'elles considèrent qu'elles sont sous-évaluées (Luigi, P. et Sorin, V. 2009).

2.2. La structure de capital optimale et le secteur des assurances

Contrairement aux entreprises industrielles, les compagnies d'assurances reçoivent des primes⁶, payées par l'assuré et en constitue la principale source de financement⁷ en échange éventuellement d'une indemnisation en cas de réalisation d'un sinistre. Ainsi, elles sont tenues par la réglementation de constituer dans le passif de leur bilan des provisions techniques, qui doivent être investies dans des actifs financiers.

En effet, bien que les théories sur la structure du capital mettent l'accent sur l'utilisation de la dette financière par rapport aux capitaux propres, dans la littérature sur l'assurance il est généralement avancé que la dette financière soit limitée, et que la différence entre le portefeuille d'actifs et les provisions techniques soit essentiellement financée par les capitaux propres.

Vu l'existence d'études très limitées sur la structure du capital dans le domaine des assurances (Dhaene, J. et al 2015), on se concentrera dans la suite de notre travail sur la théorie du compromis et la théorie de la hiérarchie.

⁶ Vu le caractère d'inversion du cycle de production des assurances.

⁷ Staking, K. et Babbel, David. (1995) considèrent que les assurés agissent en tant que prêteurs à l'assureur.

La littérature sur l'assurance reconnaît les mêmes avantages et inconvénients au maintien de l'équité que ceux évoqués dans la théorie du compromis⁸, mais les développe dans le cadre des spécificités du contexte de l'assurance. De même, elle approuve qu'en raison de la double imposition des revenus d'investissement, l'utilisation des capitaux propres à un coût fiscal⁹ compensé par un risque de faillite plus faible. Toutefois, ce compromis diffère selon le secteur d'activité vu la période longue de l'assurance vie par rapport à l'assurance non-vie.

Dans ce sens, selon la théorie du compromis, les compagnies d'assurance sont tenues de mettre en balance les avantages et les coûts de la détention de capital permettant de réduire le risque d'insolvabilité, malgré que la réglementation des assurances exige l'existence d'un capital minimal de solvabilité. Car dans le secteur des assurances, la confiance dans la solvabilité et la pérennité des assureurs est d'une importance majeure à cause de la sensibilité des assurés envers le risque de ruine de compagnies d'assurance¹⁰.

Par ailleurs, la théorie du compromis considère que la détention de capital par les compagnies d'assurance ainsi que son ajustement sont coûteux¹¹, notamment les coûts d'agence, vu l'existence des asymétries d'information entre les décideurs, qui peuvent abuser de leur connaissance interne de l'entreprise, et les actionnaires (Myers, S. et Majluf, N. 1984). On peut se trouver dans la situation dans laquelle les gestionnaires choisissent d'investir dans des actifs en fonction de leur intérêt personnel, et ce, compte tenu du délai entre l'encaissement des primes et le paiement des sinistres.

En ce concerne la théorie de l'ordre hiérarchique, celle-ci prévoit que le financement externe est plus coûteux que les fonds internes, car les parties externes n'ont pas une connaissance complète de la situation de la compagnie d'assurance. Les assureurs sont, alors, appelés à faire moins recours à l'endettement financier que les entreprises industrielles qui sont tenues, souvent, de faire d'importants investissements dans des actifs avant de pouvoir réaliser des ventes (Dhaene, J. et al 2003).

⁸C'est-à-dire les impôts par rapport au risque de faillite, les problèmes d'agence par rapport au surendettement et à la substitution d'actifs.

⁹ Voir dans ce sens Cummins, D. et Grace, E. (1994), Bradford, D. et Logue, K. (1999) et Cheng, J. et Weiss, A. (2012).

¹⁰ Cummins, D. et Danzon, P. (1997) ont démontré que le risque de ruine est négativement corrélé avec les prix de l'assurance.

¹¹ Pour Cummins, D et Grace E. (1994), le capital détenu par les assureurs est soumis à une double imposition auquel s'ajoutent d'autres imperfections du marché pouvant rendre la détention du capital plus coûteuse.

En effet, les assureurs ont moins de problèmes à cet égard vu le caractère d'inversion du cycle de production du secteur d'assurance d'une part, et d'autre part, la levée des fonds propres est plus coûteuse pour les assureurs à cause de l'asymétrie d'information (Cummins, D. et Nini, G. 2002).

La plus importante source d'asymétrie d'information est relative aux provisions techniques estimées¹² vu que les assurés potentiels, en tant que parties externes, sont incertains quant à la capacité financière future de l'assureur, puisqu'ils ne possèdent pas les connaissances techniques des risques utilisées par les assureurs, qui de leur part, ne communiquent pas d'informations détaillées sur les risques qu'ils couvrent (Cheng, J. et Weiss, M. 2012).

2.3. Les déterminants de la structure de capital

Contrairement à l'hypothèse de Modigliani et Miller, qui considère l'existence d'un marché parfait, la théorie du compromis, celle de l'ordre hiérarchique considèrent que plusieurs facteurs internes et/ou externes peuvent influencer la détermination de l'effet de levier de l'entreprise (Kayo, E., Kimura, H., 2011).

De ce fait, un certain nombre de variables ont été identifiées par la littérature empirique comme hautement attribuables dans la prise de décision concernant la structure de capital des entreprises ; il s'agit notamment de la rentabilité, l'opportunité de croissance, la tangibilité des actifs, la taille, le risque de l'entreprise, la fiscalité, etc...

2.3.1. Rentabilité

La rentabilité est une variable explicative importante qui influence la structure du capital. Toutefois, il n'existe pas de prévisions théoriques des effets de la rentabilité sur l'effet de levier. Du point de vue de la théorie du compromis, les entreprises plus rentables devraient avoir un effet de levier plus important parce qu'elles ont plus de revenus à protéger des impôts (Dhaene, J. et al. 2015).

¹²Zhang, T. et al (2009) développent l'idée que les assureurs sont confrontés à l'asymétrie d'information plus que les banques, car le passif des banques est caractérisé généralement par des durées et des montants bien définis alors que le passif des assureurs génère des informations plus asymétriques en raison de la durée plus ou moins incertaine des paiements des sinistres et de l'ambiguïté de prévoir les montants à indemniser.

Dans ce sens, Mugosa, A. (2015) arguent que d'après la même théorie, les firmes rentables peuvent déplacer leur structure de capital vers l'endettement pour plusieurs raisons. La première consiste dans le fait que lorsque la rentabilité augmente, le coût de faillite diminue potentiellement. Tandis que la deuxième raison réside dans le fait que la possibilité de réduire l'assiette fiscale, en soustrayant le coût des intérêts, incite les entreprises à émettre des dettes.

Par opposition à l'interdépendance positive précitée, la théorie de l'ordre hiérarchique considère que les entreprises rentables sont susceptibles de disposer de suffisamment de fonds pour ne pas avoir à recourir à des sources extérieures. Autrement dit, les firmes les plus rentables ont moins besoin de financement externe, et auront alors, un effet de levier moins important. Cette explication suggère une relation négative entre la rentabilité et l'endettement.

2.3.2. Croissance

La théorie du compromis considère que les entreprises ayant plus de possibilités d'investissement ont tendance à émettre moins de dettes, par crainte d'investissements potentiellement non rentables et de difficultés financières, ou de problèmes d'agence entre les actionnaires et les créanciers, ainsi la croissance prévue d'une entreprise à l'avenir devrait entraîner une corrélation négative avec le levier financier (Mugosa, A. 2015).

En revanche, la théorie de l'ordre hiérarchique prévoit une relation positive entre la croissance et l'endettement. D'après ladite théorie, les entreprises à croissance relativement élevée auront tendance à émettre moins de titres, action qui permettra aux entreprises à croissance relativement élevée d'avoir un effet de levier plus important.

2.3.3. Tangibilité des actifs

La plupart des théories sur la structure du capital soutiennent l'hypothèse, selon laquelle, le type d'actifs détenus par une entreprise affecte d'une certaine manière le choix de sa structure de capital (Titman, S. et Wessels, R. 1988). Pour Booth, L. et al. (2001), « Plus les actifs de l'entreprise sont tangibles, plus sa capacité à émettre des dettes garanties est grande et moins l'information sur ses bénéfices

futurs est révélée ». Titman, S. et Wessels, R. (1988) arguent l'existence d'une relation positive entre la tangibilité des actifs et l'effet de levier.

2.3.4. Taille

Un aspect tel que la taille d'une entreprise a clairement un impact significatif sur la structure de capital des entreprises, car celle-ci peut se substituer à l'efficacité des firmes du fait que généralement ce sont les grandes entreprises qui sont efficaces. Dans ce sens, Baker, K. et Martin, G. (2011) estiment que les grandes entreprises ont tendance à avoir un portefeuille d'activités diversifié, ce qui implique une moindre volatilité des flux de trésorerie, un coût de détresse financière et une probabilité de ruine moins élevés que ceux des petites entreprises. Ceci implique également de meilleures conditions d'emprunt, une force de négociation plus forte et un accès plus facile aux fonds¹³.

En ce qui concerne le fondement théorique, la théorie du compromis admet l'existence d'une relation positive entre la taille et l'effet de levier. Tandis que selon la théorie de l'ordre hiérarchique, il existe, une corrélation négative entre la taille de l'entreprise et l'endettement, en raison d'une moindre asymétrie d'information entre les dirigeants de l'entreprise et les investisseurs.

2.3.5. Liquidité

Les conclusions des différents chercheurs qui ont travaillé sur le lien entre la liquidité et la structure du capital sont divergentes, certains trouvant un effet positif, d'autres une relation négative.

2.3.6. Risque de l'entreprise

Le niveau de risque est considéré comme l'un des principaux déterminants de la structure du capital des entreprises, induisant généralement une relation négative avec l'effet de levier comme le démontrent Huang, G., Song, F. (2002), Booth, L. et al. (2001) ainsi que Titman, S. et Wessels, R. (1988).

¹³Mugosa, Ana. (2015) "The Determinants of Capital Structure Choice: Evidence from Western Europe." *Business and Economic Horizons*, vol. 11, no. 2, pp. 76– 95, page 78.

Ainsi, les résultats des études empiriques traitant la corrélation entre les déterminants de structure de capital cités ci-haut et l'endettement. La majorité des études qu'on a sélectionné ont été effectuées sur le secteur des assurances.

Tableau 1 : L'impact des déterminants de structure de capital et l'endettement - résultats d'études empiriques sélectionnées.

Déterminants	Impact positif	Impact négatif
Rentabilité	Mugosa (2015)	Harris et Raviv (1991), Rajan et Zingales (1995) Booth et al. (2001) Titman et Wessels (1988). Amraoui et al. (2018) Ahmed et al. (2010) Hassan (2012) Sharif et al. (2012) Tornyeva (2013) Vinasithamby (2014) Anthonyn et Odunayo (2015) Al Singlawi et Aladwan (2016)
Tangibilité	Titman et Wessels (1988), Booth et al. (2001) Hassan (2012)	Vinasithamby (2014)
Croissance	Hassan (2012) Tornyeva (2013) Shala et al. (2014)	Mugosa (2015) Booth et al. (2001) Titman et Wessels (1988), Huang et Song (2002) Vinasithamby (2014) Anthonyn et Odunayo (2015) Guruswamy et Adugnaw (2016) Al Singlawi et Aladwan (2016)
Taille	Rajan et Zingales (1995) Amraoui et al. (2018) Ahmed et al. (2010) Sharif et al. (2012) Tornyeva (2013) Shala et al. (2014) Vinasithamby (2014) Anthonyn et Odunayo (2015)	Titman et Wessels (1988) Lim (2012) Hassan (2012) Al Singlawi et Aladwan (2016)
Liquidité	Amraoui et al. (2018) Shala et al. (2014)	Ahmed et al. (2010) Sharif et al. (2012) Vinasithamby (2014) Anthonyn et Odunayo (2015)
Risque	Ahmed et al. (2010) Gatsi et Gadzo (2013) Anthonyn et Odunayo (2015) Guruswamy et Adugnaw (2016)	Huang et Song (2002), Booth et al. (2001) Titman et Wessels (1988) Al Singlawi et Aladwan (2016)

Source : élaboré par nos propres soins à partir de la revue de littérature

D'après le tableau ci-dessus, il paraît évident que les chercheurs ont identifié des facteurs communs influençant de manière significative la structure. Toutefois, l'impact de ses déterminants varie d'un auteur à l'autre en raison probablement des variations de l'environnement économique et sociale des pays ainsi que du type de données utilisées dans leurs modèles.

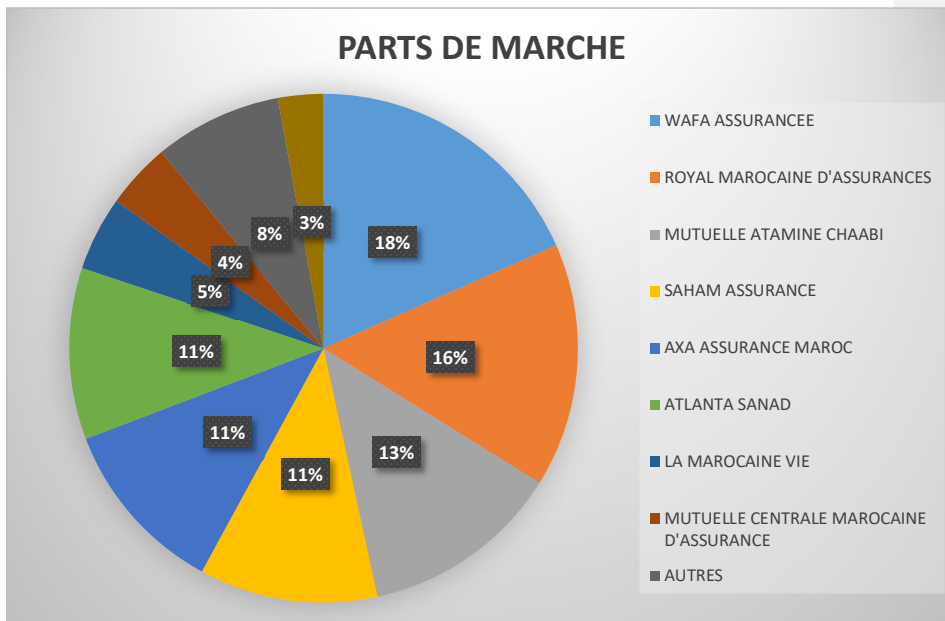
3) Cadre méthodologique

Pour atteindre l'objectif de ce travail de recherche, une étude exploratoire, empirique a été menée via l'utilisation de la modélisation en données de panel sur une population composée de 17 compagnies d'assurances marocaines, au cours de la période 2011-2019. Les données utilisées pour cette étude sont de nature secondaire collectées à partir des états de synthèse des compagnies précitées.

En effet, le secteur des assurances au Maroc compte 22 entreprises d'assurances, contenant 7 compagnies pratiquant des opérations d'assurances vie et non vie, 3 compagnies qui vend uniquement des produits d'assurances non-vie et 2 compagnies d'assurance de personnes, 5 qui pratiquent uniquement de l'assistance et 3 spécialisées en assurance-crédit, dont 20 compagnies d'assurance commerciales et 4 mutuelles¹⁴. Le graphe ci-dessous retrace la répartition des parts de marché du secteur des assurances. Cette répartition met en évidence la concentration de 80% des parts de marché entre uniquement 6 compagnies d'assurances de la place.

¹⁴ Rapport du secteur des assurance 2021, Autorité de Contrôle des Assurances et de la Prévoyance Sociale, page 5.

Graphique 1 : parts de marché du secteur marocain des assurances



Source : rapport ACAPS 2021

Par conséquent, l'échantillon choisi dans ce travail a pris en considération quelques restrictions, qui ont été légitimes, pour avoir une bonne représentabilité du secteur. En effet, il a fallu cibler seulement les compagnies d'assurance par actions opérationnelles, et qui n'ont pas été objet des opérations de fusion acquisition.

Concernant le modèle adopté dans le présent travail, la composante endogène de la variation de la dette est proportionnelle à la différence entre le ratio d'endettement d'une assurance et le ratio d'endettement au début de la période, et l'équation de départ s'écrit ainsi :

$$\Delta Debt_{i,t} = \alpha \cdot (Debt_{i,t}^* - Debt_{i,t-1}) + \xi_{i,t} \quad (1)$$

Où

$Debt_{i,t-1}$ est le ratio d'endettement de début de période de la i-ème compagnie.

$\Delta Debt_{i,t} = Debt_{i,t} - Debt_{i,t-1}$ est la variation du ratio d'endettement de la i-ème compagnie pendant la période t (Δ désigne l'opérateur de différence première).

$Debt_{i,t}^*$ est le ratio d'endettement cible de la i-ème compagnie.

Le ratio d'endettement $Debt_{i,t}^*$ pour une i-ème compagnie d'assurance marocaine est déterminée par le modèle auxiliaire :

$$Cap_{i,t}^* = \gamma_0 + X'_{i,t} \cdot \Gamma \quad (2)$$

Où

γ_0 est une constante

$X_{i,t}$ est un vecteur (une matrice $k \times 1$) de k variables définies par :

$$X_{i,t} = \begin{pmatrix} x_{i,t}^1 \\ \vdots \\ x_{i,t}^k \end{pmatrix} \quad (3)$$

et Γ est un vecteur constant (une matrice $k \times 1$) de k coefficients défini par :

$$\Gamma = \begin{pmatrix} \gamma_1 \\ \vdots \\ \gamma_k \end{pmatrix} \quad (4)$$

Γ est appelé coefficient-vecteur d'ajustement. $X'_{i,t}$ désigne la transposée de la matrice $X_{i,t}$.

Avec ces notations, l'équation (1) peut être écrite :

$$Debt_{i,t}^* = \gamma_0 + \sum_{j=1}^k \gamma_j \cdot x_{i,t}^j \quad (5)$$

Si on remplace $Debt_{i,t}^*$ par $\gamma_0 + X'_{i,t} \cdot \Gamma$ dans l'équation de départ (1) de la variation du ratio d'endettement on obtient :

$$\begin{aligned} \Delta Debt_{i,t} &= \alpha \cdot (\gamma_0 + X'_{i,t} \cdot \Gamma - Debt_{i,t-1}) + \xi_{i,t} && \Leftrightarrow \\ Debt_{i,t} - Debt_{i,t-1} &= \alpha \cdot \gamma_0 + \alpha \cdot X'_{i,t} \cdot \Gamma - \alpha \cdot Debt_{i,t-1} + \xi_{i,t} && \Leftrightarrow \\ Debt_{i,t} &= \alpha \cdot \gamma_0 + X'_{i,t} \cdot (\alpha \cdot \Gamma) - \alpha \cdot Debt_{i,t-1} + Debt_{i,t-1} + \xi_{i,t} && \Leftrightarrow \\ Debt_{i,t} &= \alpha \cdot \gamma_0 + X'_{i,t} \cdot (\alpha \cdot \Gamma) + (1 - \alpha) \cdot Debt_{i,t-1} + \xi_{i,t} && (6) \end{aligned}$$

En fixant $\theta_0 = \alpha \cdot \gamma_0$ et $\Theta = \alpha \cdot \Gamma$ on obtient le modèle économétrique suivant:

$$Debt_{i,t} = \theta_0 + X'_{i,t} \cdot \Theta + (1 - \alpha) \cdot Debt_{i,t-1} + \xi_{i,t} \quad (7)$$

Avec : $\xi_{i,t}$ exprime les termes de résidus de l'équation du ratio d'endettement pour la compagnie d'assurance (i) au cours de l'exercice (t).

La caractérisation de la variation observée du ratio d'endettement est, donc, modélisée comme ayant deux composantes, l'une discrétionnaire et l'autre exogène et dissuasif.

Techniquement et après avoir présenté le modèle adopté, il est important de présenter les principales variables endogènes et exogènes utilisées de ce travail.

En ce qui concerne la variable endogène utilisée, il s'agit du ratio d'endettement qui est défini comme le rapport entre la valeur de marché de la dette à long terme et la valeur de marché des capitaux propres. Nous retenons dans cette étude la formule suivante, comme mesure du ratio d'endettement des compagnies d'assurances :

$$Debt_t = \frac{Dettes\ financières_t}{Capitaux\ Propres_t} \quad (8)$$

Pour estimer les déterminants de structure de capital des compagnies d'assurance marocaines, nous avons fait appel à certaines variables explicatives et quelques variables de contrôle. Dans ce sens, le ratio d'endettement est fonction des niveaux d'endettement visé et de tout facteur exogène. Dans cette étude, le ratio d'endettement est influencé par un certain nombre de variables explicatives. Ces variables, dites exogènes, auront pour but d'approximer et décrire tous les changements observés et inobservés de la variable endogène, et leurs paramètres conditionnent en conséquence les changements dynamiques dans le ratio en question.

i) La rentabilité des actifs

La rentabilité des actifs nommée ROA¹⁵ ou profitabilité est mesurée par la formule suivante :

$$ROA_t = \frac{\text{Résultat avant impôt}_t}{\text{Total actif}_t} \quad (9)$$

la rentabilité est déterminée par le résultat avant impôt qui fournit une idée sur la rentabilité globale de la compagnie d'assurance. Ce ratio est plus approprié que celui qui renseigne sur la profitabilité du capital nommé ROE¹⁶.

ii) *Tangibilité*

La tangibilité des actifs constitue le rapport entre l'actif immobilisé de la compagnie d'assurance ainsi que l'actif total détenu par cette dernière.

$$Tang_t = \frac{\text{Actif immobilisé}_t}{\text{Total actif}_t} \quad (10)$$

iii) *Croissance*

En théorie, la rentabilité peut être mesurée de plusieurs manières. Dans le cadre de notre étude, nous avons utilisé le rapport entre la variation de l'actif total de la compagnie d'assurance et l'actif total de celle-ci durant la période t :

$$Growth_t = \frac{\text{Total actif}_t - \text{Total actif}_{t-1}}{\text{Total actif}_t} \quad (11)$$

iv) *La taille*

La taille de l'assureur constitue un déterminant important du comportement des compagnies d'assurance selon la littérature sur l'assurance en matière d'économie d'échelle (Grace, M. et Timme, S. 1992). La taille est mesurée par le logarithme de l'actif total.

$$Taille_t = \log (\text{Total actif}_t) \quad (12)$$

¹⁵ C'est un terme en anglais, signifie : *Return on Assets*, peut être traduit en français par le taux de rendement de l'actif objet de l'investissement. C'est un ratio qui indique l'efficacité avec laquelle la compagnie d'assurance manage ses actifs.

¹⁶ C'est un terme en anglais, signifie : *return on equity*, il s'agit d'un terme comptable qui mesure la rentabilité des capitaux propres que les actionnaires d'une entreprise mettent à sa disposition.

v) *Liquidité*

La variable exogène liquidité est déterminée sur la base du rapport entre l'actif encaissable et le passif décaissable d'une compagnie d'assurance.

$$Liquidité_t = \frac{Actif\ circulant_t}{Passif\ circulant_t} \quad (13)$$

vi) *Provisions techniques*

La variable provisions techniques d'une compagnie d'assurance est mesurée la formule suivante :

$$PT_t = \frac{Provisions\ techniques_t}{Total\ actif_t} \quad (14)$$

vii) *Le risque*

Cependant, les travaux empiriques qui ont été réalisés principalement sur le secteur bancaire ont approché le risque par deux principaux ratios : le ratio des actifs pondérés par les risques (RWA/Total actif), et le z-score. Dans notre cas, l'indicateur retenu est le z-score d'Altman. E (1968). Cet outil est largement utilisé dans le domaine financier et se calcule sur la base de la formule suivante :

$$Risk_t^1 = z - score = \frac{Solv_t - \overline{Solv}}{\sigma_{Solv}} \quad (15)$$

Ainsi, à partir des études empiriques citées ci-haut, et en introduisant l'ensemble des variables explicatives retenues dans notre étude, l'équation 8 s'écrit comme suit :

$$\begin{aligned} Debt_{i,t} = & \theta_0 + ROA_{i,t} + TANG_{i,t} + GROWTH_{i,t} + SIZE_{i,t} \\ & + LIQUIDITY_{i,t} + PT_{i,t} + RISK_{i,t} + (1 - \alpha) \cdot Debt_{i,t-1} \\ & + \xi_{i,t} \end{aligned} \quad (16)$$

4) Résultat

4.1. *Statistiques descriptives*

Avant d'entamer l'estimation de notre modèle, il est primordial de commencer par une analyse statistique du marché marocain des assurances ainsi qu'une analyse du comportement des différentes variables utilisées dans ledit modèle.

Tableau 2 : Statistiques descriptives des variables étudiés

	DEBT	ROA	TANG	GROWTH	SIZE	LIQUIDITY	PT	RISK
Mean	0.722	0.037	0.717	0.076	9.588	2.355	0.608	0.002
Median	0.004	0.023	0.766	0.058	9.806	2.222	0.683	-0,328
Maximum	24.686	0.145	0.937	1.000	10.636	6.878	0.917	2.999
Minimum	0.000	-0,089	0.072	-0,210	7.787	0.833	0.077	-2,930
Std. Dev.	2.834	0.041	0.190	0.130	0.760	1.054	0.213	1.072
Observations	153	153	153	153	153	153	153	153

Source : Élaboré à partir des états de synthèse de notre échantillon

Le tableau 2 permet de donner un aperçu sur les principales métriques des variables utilisées dans notre modèle économétrique. Le ratio d'endettement indique que 72% des actifs totaux des compagnies d'assurances sont financés par recours à l'emprunt et 28% par les actionnaires avec l'existence d'une disparité assez importante. Pour ce qui est de la rentabilité globale de l'échantillon, elle s'est établie sur 3,7% avec une disparité peu significative à l'intérieur de l'échantillon de 0,04 point ce qui indique que toutes les compagnies de la place arrivent à générer des revenus à partir de leurs actifs. Quant à la tangibilité, celle-ci indique qu'en moyenne les compagnies d'assurances disposent de 72% d'actifs fixes dans leur bilan. La variable GROWTH indique que pour chaque augmentation de 1% du total des actifs des compagnies d'assurance leurs ventes augmenteront de 8%.

Le tableau 2 Indique également la variable Taille a une moyenne de 9,588, avec une quasi-absence de disparité entre la taille des compagnies choisies à cause de l'existence d'une médiane presque égale à la moyenne. La variable liquidity met en évidence qu'en moyenne les compagnies d'assurance peuvent honorer leurs dettes à court terme indiquant ainsi la bonne santé financière du secteur. Du côté des provisions techniques réglementaires, elles sont de 0,608 avec une disparité de 0,21. Ces provisions ont une grande influence sur le montant des fonds propres disponibles, et donc, sur le capital détenu par les compagnies d'assurances. Enfin la variable RISK indique qu'en moyenne le risque encourus par les compagnies marocaines d'assurances est faible qui peut se justifier par une aversion quant à la prise de risques par les dirigeants.

4.2. Tests de validation du modèle économétrique

Le choix de la méthode d'estimation pour résoudre notre modèle économétrique nous oblige à traiter le problème d'endogénéité. D'où la nécessité d'effectuer les tests de spécification par le test de la validité de la structure du panel avant d'entamer toutes analyses ou estimations sur les variables des modèles. En d'autres termes, il s'agit de s'interroger sur l'existence d'une forme d'hétérogénéité entre les individus, et s'il est pertinent de considérer les données comme des données de panel¹⁷.

Le tableau 3 donne les résultats des tests de spécification de la structure du panel de notre modèle économétrique. En effet, les résultats montrent que la structure de panel est confirmée, les données peuvent par conséquent être considérées comme des données de panel. La question de l'homogénéité elle aussi est rejetée, par conséquent on peut considérer la présence des effets dans la structure du panel. Les résultats confirment que ces effets sont des effets individuels en se renseignant à la valeur de la statistique de Fisher. Le test de Hausman indique que ces effets sont aléatoires en vérifiant le rejet de l'hypothèse alternative qui stipule des effets sont fixes.

Tableau 3 : Tests de spécification du modèle relatif aux normes réglementaires

Equations	<i>F-Stat</i>		<i>Chi-deux</i>	
	H^1	H^2	H^3	<i>Test de Hausman</i>
<i>Debt_{i,t}</i>	106.8564***	137.7626***	1.338220**	8.98

Notes : *, ** et *** représentent la significativité à hauteur de 10%, 5% et 1%.

Deux facteurs majeurs peuvent expliquer la nature hétérogène du panel. Le premier est dû à l'agrégation des données qui agrègent deux sources de variabilité (compagnies d'assurance et le temps). Le second facteur a trait aux disparités entre les compagnies d'assurance marocaines qui persiste dans le temps. De même, et vu

¹⁷ Des travaux de recherche entament des estimations économétriques avant même de vérifier la structure du panel. Cette démarche ne permet pas d'identifier la méthode d'estimation qu'il faut choisir et donnerait des estimations biaisées.

que les compagnies ont été sélectionnées de manière aléatoire, il paraît que l'utilisation du modèle à effet aléatoire est le plus adapté.

Par la suite nous avons effectué le test de stationnarité des variables utilisés dans notre modèle. A cet effet, on a fait les « tests de racine unitaire sur des données de panel », notamment les tests de Levin, Lin et Chu (LLC), Im, Pesaran et Shin (IPS) et Maddala et Wu (ADF-Fisher) appliqués sur les séries en niveau et sur les séries en différences premières. Il sied de signaler que ces tests ont été réalisés sur la base d'une sélection automatique du retard, le critère d'information de Schwarz et une estimation spectrale de Kernel avec la sélection de Newey-West.

Tableau 4 : Tests de racine unitaire en données de panel

	LLC		LPS		ADF-Fisher		Décision : Stationnaire en
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	
DEBT_{i,t}	-2084.06***	-1574.72***	-7780.04***	-11887.2***	131.14***	117.64***	Niveau
ROA_{i,t}	-6.44***	-9.62***	-0.19*	-4.24***	40.52*	85.87***	Différence
TANG_{i,t}	-0.91*	-3.62***	0.44*	-1.44*	32.69*	49.09**	Différence
GROWTH_{i,t}	-2.28**	-7.37***	-0.87	-2.89***	46.02*	64.40***	Différence
SIZE_{i,t}	0.0008	-8.69***	2.45	-0.63	28.44	43.74	Différence
LIQUIDITY_{i,t}	-2.29**	-11.52***	0.16	-2.75**	41.59	64.63**	Différence
PT_{i,t}	-3.16***	-4.84***	-1.01	-1.20	51.06**	46.92*	Niveau
RISK_{i,t}	-595.75***	-337.27***	-223.25***	-120.40***	312.35***	283.18***	Niveau

I(0) et I(1) Présentent respectivement le test en niveau et le test en différence
*, ** et *** représentent la significativité à hauteur de 10%, 5% et 1%.

Les résultats des tests¹⁸ figurant dans le tableau 4 met en exergue la stationnarité de la plupart des variables exogènes après différenciation. Ainsi, concernant les séries *Debt_{i,t}*, *PT_{i,t}* et *RISK_{i,t}*, et au seuil de significativité de 1%, l'hypothèse de non-stationnarité des séries est acceptée en niveau.

¹⁸ Il s'agit des tests de Levin, Lin et Chu, de Breitung, de Im, Pesaran et Shin et ADF Fisher.

Concernant les séries $ROA_{i,t}$, $TANG_{i,t}$, $GROWTH_{i,t}$, $SIZE_{i,t}$ et $LIQUIDITY_{i,t}$, les résultats des tests de racine unitaire affichent la stationnarité en différence première de ces variables. Ceci dit, on procédera à une transformation différenciée desdites variables et compte tenu de notre équation de départ, on obtient :

$$\begin{aligned} Debt_{i,t} = & \theta_0 + \Delta ROA_{i,t} + \Delta TANG_{i,t} + \Delta GROWTH_{i,t} + \Delta SIZE_{i,t} \\ & + \Delta LIQUIDITY_{i,t} + PT_{i,t} + RISK_{i,t} + (1 - \alpha).Debt_{i,t-1} \quad (17) \\ & + \xi_{i,t} \end{aligned}$$

4.3. Estimation du modèle

On procédera à une estimation du modèle de panel dynamique avec l'estimateur des Moments Généralisés (GMM d'Arellano et Bond 1991). Cette méthode d'estimation est une technique d'estimation qui permet une minimisation de certains critères. Elle consiste à ne spécifier que la forme paramétrique de certains moments¹⁹ et d'utiliser ces moments pour construire les conditions d'identification, tout en rendant l'échantillon pareil à la population²⁰. Aussi, l'estimateur des moments généralisés n'exige pas une information exacte quant à la distribution des résidus. Ce qui met en relief la robustesse de l'estimateur GMM face à une mauvaise spécification du modèle.

Comme, cette méthode d'estimation fait partie des méthodes qui utilisent des variables instrumentales, chose qui lui permet de résoudre le problème d'endogénéité via le remplacement des variables suspectées être endogènes par d'autres adéquats.

On estime, alors, que l'estimation de notre modèle économétrique par la méthode des moments généralisées d'Arellano et Bond 1991 donnera plus de robustesse à nos résultats. Le tableau 5 relate les résultats des estimations dynamiques estimées en système en utilisant l'estimateur de GMM, ce qui supprime l'impact des effets fixes ne laissant ainsi que les relations variant entre les individus et le temps.

¹⁹ La méthode GMM est un outil d'estimation intuitif qui estime les paramètres recherchés en égalisant certains moments théoriques avec leurs contreparties empiriques.

²⁰ Pour une analyse détaillée de la méthode des moments généralisés, voir article (Fève Patrick, Langot François. La méthode des moments généralisés et ses extensions : théorie et applications en macro-économie. In: *Économie & prévision*, n°119, 1995-3. pp. 139-170).

Tableau 5 : Estimation par la méthode des moments généralisés

Variables		<i>Debt_{i,t}</i>
$\Delta ROA_{i,t}$	-7.973***	(-6.46)
$\Delta TANG_{i,t}$	9.833***	(20.72)
$\Delta GROWTH_{i,t}$	-0.67	(-1.48)
$\Delta SIZE_{i,t}$	16.06***	(11.78)
$\Delta LIQUIDITY_{i,t}$	0.74***	(13.34)
$PT_{i,t}$	0.47	(0.34)
$RISK_{i,t}$	1.78***	(13.93)
$Debt_{i,t-1}$	-0.01*	(-1.97)
J-statistic		9.771
Nombre d'instruments		17
Determinant residual covariance		0,0324

Notes : *, ** et *** représentent la significativité à hauteur de 10%, 5% et 1%.
Les valeurs de T-stat figurent entre les parenthèses.

Une lecture générale des résultats du modèle économétrique adopté montre qu'ils sont satisfaisants. L'évaluation globale du modèle est réalisée par la statistique de J-Stat qui est supérieure à de 5%, ce qui signifie que tous les instruments qu'on a appréhendé pour la réalisation de cette estimation sont exogènes lorsqu'ils sont pris ensemble. Dans un autre sens les variables instrumentales auxquelles on a fait l'estimation n'enregistrent pas des corrélations avec les termes d'erreur et permettent, ainsi, de valider nos estimations.

Les résultats de notre devront être présentés dans un tableau synthétique séquentiels pour mieux exploiter les résultats qui sont statistiquement significatifs et raisonnablement interprétables. Le tableau 6 donne un aperçu sur les principaux résultats obtenus à partir de l'estimation des moments généralisés du modèle adopté.

Tableau 6: Synthèse des résultats du modèle économétrique

Variable	<i>Endettement</i>
<i>Rentabilité des actifs</i>	Impact significativement négatif
<i>Tangibilité</i>	Impact significativement positif
<i>Croissance</i>	Impact négatif non significatif
<i>La taille</i>	Impact significativement positif
<i>Liquidité</i>	Impact significativement positif
<i>Provisions techniques</i>	Impact positif non significatif
Risque	Impact significativement positif

5) Conclusions

La problématique de déterminants de structure de capital est devenue primordiale dans la littérature financière sauf qu'au niveau du secteur des assurances nous estimons qu'aucune étude n'appréhender l'impact des déterminants de structure de capital sur l'endettement des compagnies d'assurances marocaines. A cet effet, dans le présent travail de recherche nous avons tenté de répondre à cette question via l'adoption d'une méthodologie basée sur la modélisation des données de panel.

Dans un souci de respect d'une parfaite adéquation de données dans le processus d'estimation, nous avons retenu 17 compagnies d'assurances marocains sur 9 ans de la période allant de 2011 à 2019. Dans ce qui suit nous tenterons de mettre en lumière le plus clairement possible le fruit de notre processus méthodologique.

Les résultats de notre modèle empirique suggèrent que la plupart des variables endogènes utilisées affecte de manière significative le ratio d'endettement des compagnies d'assurances marocaines.

Ainsi, et sur la base des constats empiriques, le taux rentabilité a un impact négatif et statistiquement significatif sur le ratio d'endettement du secteur marocain des assurances, ce qui concorde avec la théorie de l'ordre hiérarchique. Ceci dit, les compagnies ayant un taux de rentabilité élevé ont moins recours à l'endettement comme source de financement externe et préfèrent les fonds générés en interne.

Contrairement à la rentabilité, l'impact de la tangibilité est significativement positif, ce qui corrobore avec les prédictions de théorie de l'ordre hiérarchique. Ce résultat peut se s'expliquer par le fait que les compagnies d'assurances donnent leur actif tangible comme garantie, et plus leur actif immobilisé figurant dans leur bilan est important plus elles ont recours à la dette.

Concernant la variable croissance, notre modèle a révélé un effet négatif sur l'effet de levier des compagnies d'assurances marocaines, sauf que cet impact n'est pas statistiquement significatif, ce qui signifie que le ratio d'endettement n'est pas affecté par le taux de croissance de celle-ci et que les compagnies ont croissance ont moins recours au financement externe à cause du coût élevé qui sera exigé par les créanciers. Ce résultat met en évidence une réticence des dirigeants des compagnies d'assurances en croissance quant aux risques financiers.

Pour ce qui est de la taille des compagnies d'assurances, qui permet de donner une idée sur la variabilité des souscriptions réalisées par celles-ci, a un impact significativement positif sur le ratio d'endettement, ce qui confirme les prédictions de la théorie de compromis et de Titman, S. et Wessel, R. (1988). De ce fait, une augmentation de la taille des compagnies d'assurances entraînera une augmentation du ratio d'endettement de ces dernières dû à l'existence de faible risque de faillite.

Aussi, le modèle GMM indique une relation positive et hautement significative de la variation de la liquidité sur l'effet de levier des compagnies marocaines des assurances. En effet, ce ratio représente l'aptitude des sociétés à honorer leurs engagements à court terme. Le résultat obtenu concorde avec celui de la théorie du compromis et donc l'augmentation de ratio est signe de stabilité financière des entreprises.

La variable provisions techniques à un signe positif mais statistiquement non significatif. il sied de rappeler que les provisions techniques réglementaires sont imposées par l'autorité de contrôle des assurances et de la protection sociale (ACAPS), enregistrées dans le passif du bilan des compagnies d'assurances, représentent l'engagement des assurances face à la survenance éventuelle d'un sinistre. Le résultat non significatif obtenu signifie que les provisions techniques n'influencent pas la structure de capital des compagnies d'assurances marocaines.

Enfin, les résultats du modèle montrent un impact significativement positif du risque sur l'effet de levier. Les compagnies d'assurances courent plus de risques sont celles qui sont les plus endettées

En définitif, la présente étude a apporté des contributions importantes quant à la structure de capital des compagnies marocaines des assurances, mais il est recommandé de prévoir d'autres études dans le domaine de la décisions financières du secteur marocain des assurances qui a longtemps été depuis longtemps de la discussion sur la structure.

Ainsi, les futurs travaux de recherche devraient élargir les variables pouvant impacter la structure de capital notamment les variables macroéconomiques comme le produit intérieur brut que nous n'avons pas pu intégrer dans notre analyse faute d'absence de données dans ce sens. Comme il serait plus intéressant de procéder à une décomposition du ratio d'endettement des compagnies d'assurances en court moyen et long terme que ne n'avons pas pris en compte pour manque d'information dans ce sens.

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Can CSR engagement improve firm's resilience to the COVID-19 pandemic? Evidence from the Moroccan stock market.

Pode o envolvimento na RSE melhorar a resiliência da empresa à pandemia de COVID-19? Dados do mercado bolsista marroquino

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Abstract: The purpose of this paper is to investigate empirically the role of corporate social responsibility engagement on stock returns during the COVID-19 crisis in the case of a sample of Moroccan listed companies. The authors use a difference-in-difference (DiD) regression estimated on a panel dataset of a sample of 23 Moroccan listed companies for the period spanning from March 2019 to March 2021. We identified the connection between CSR activities and financial returns by comparing the monthly stock returns of the treatment and the control groups. Empirical results reveal that the pandemic-induced decrease in stock returns is stronger for firms with CSR activities. It means that engaging in CSR activities does not immunize Moroccan firms during the pandemic. Our findings show that Moroccan's stock market is unable to positively value CSR activities. The results indicate that agency problems lead Moroccan investors to overinvest in costly CSR activities, which reduce the value of the firms in times of the COVID crisis and delay their recovery from it. To the best of our knowledge, this study is the first to investigate the relationship between CSR activities and the resilience of Moroccan companies. Also, this study is distinguished by using the DiD method and by exploiting data from the *Eikon Refinitiv* database.

Keywords: CSR, Resilience, Stock Returns, COVID-19 crisis, Morocco, DiD model.

Resumo: O objetivo deste artigo é investigar empiricamente o papel do envolvimento da responsabilidade social corporativa nos retornos das ações durante a crise da COVID-19 no caso de uma amostra de empresas marroquinas listadas. Os autores usam uma regressão de diferença em diferença (DiD) estimada em um conjunto de dados de painel de uma amostra de 23 empresas marroquinas listadas para o período que vai de março de 2019 a março de 2021. Identificamos a ligação entre as atividades de RSE (Responsabilidade Social das Empresas) e os retornos financeiros, comparando os retornos mensais das ações dos grupos de tratamento e de controle. Os resultados empíricos revelam que a diminuição induzida pela pandemia nos retornos das ações é mais forte para as empresas com atividades de RSE. Isto significa que o envolvimento em atividades de RSE não imuniza as empresas marroquinas durante a pandemia. As nossas conclusões mostram que o mercado de ações marroquino não consegue valorizar positivamente as atividades de RSE. Os resultados indicam que os problemas de agência levam os investidores marroquinos a investir excessivamente em atividades dispendiosas de RSE, o que reduz o valor das empresas em tempos de crise da COVID e atrasa a sua recuperação da mesma. Tanto quanto é do nosso conhecimento, este estudo é o primeiro a investigar a relação entre as atividades de RSE e a resiliência das empresas marroquinas. Além disso, este estudo distingue-se pela utilização do método DiD e pela exploração de dados da base de dados Eikon Refinitiv.

Palavras-chave: RSE, resiliência, retornos de ações, crise da COVID-19, Marrocos, modelo DiD.

1. Introduction

A growing number of empirical studies have been conducted to determine whether corporate social responsibility (CRS¹) and environmental, social and governance (ESG²) enhance or harm the firms' value, but their findings are still debatable. Some studies have shown that ESG activities are solely motivated by the managers' self-interested behaviors thus impacting negatively the firm's value (Brammer et al., 2006), while others have demonstrated the value-enhancing effect of ESG activities on the firms' value and reputation (Lins et al., 2017; Edmans, 2011). During the financial crisis scholars have found that ESG activities have a slow-release effect on systematic risk (Albuquerque et al., 2019). Firms with good

1 The Corporate Social Responsibility can be defined as the voluntary integration by companies of social and environmental concerns into their commercial activities and their relationships with stakeholders.

2 This acronym refers to the environmental, social and governance criteria used to assess and analyze how a company's strategy takes into account sustainable development and long-term issues.

ESG practices have strong resilience to shocks and have the ability to recover faster from external shocks (Benabou & Tirole, 2010).

But unlike the financial crisis of 2007–2008, the covid-19 crisis offers a unique perspective to investigate the CSR resiliency hypothesis. Currently, there is no information regarding how pandemics impact financial markets (Goodell, 2020). Nothing analogous has ever happened other than the 1918 Spanish flu pandemic in the distant past, therefore comparisons to natural disasters may only be made in the most general terms. Scholars and practitioners alike began investigating the buffer effect of ESG engagements on the company's stock performance during the pandemic and whether they contribute to the firms' resilience and fast recovery (Albuquerque et al., 2020; Ding et al., 2020).

In this study, we analyze the connection between ESG engagement and stock performance amid the COVID-19 crisis by investigating the influence of ESG engagement on the stock returns of publicly traded companies in Casablanca's stock exchange. The Moroccan stock market offers a unique perspective to re-examine the nature of the relationship as it the Moroccan stock exchange gives a different angle than that of developed countries. Furthermore, large state or family-owned conglomerates make up the lion's share of the stock market capitalization. Therefore, Moroccan traded companies suffer from a severe agency problem due to the state ownership and information ambiguity as a consequence of family-owned businesses (Piotroski et al., 2015; Jiang & Kim, 2020).

The remainder of the study proceeds as follows. In section 2 we provide a review of the related literature. Section 3 presents the data and the methodology used in the study. Section 4 presents and discusses the main results. Section 5 concludes.

2. Theoretical background

2.1. CSR and ESG activities

According to the European Commission's Green paper, CSR can be defined as "a voluntary commitment, which consists in integrating economic, social and environmental objectives in the production process and in the relationship with external and internal stakeholders and that which is required by law" (European

Commission, 2001). Based on this definition commercial, financial and industrial companies alike are not only responsible to the internal stakeholders (shareholders and debtholders) but also the broad scope of external stakeholders such as customers, suppliers and civil society. And while companies are defined as a corporate citizen from a CSR point of view, because it only focuses on the relationship of the company with its stakeholders, an ESG perspective incorporates other non-financial aspects. In other words, ESG is a broader concept than CSR, taking into consideration a wider spectrum of social values, namely sustainable development and green finance (Gillan et al., 2021). But why do companies pursue CSR and ESG activities?

The answer can be given through stakeholder and legitimacy theories. According to the first theory, firms are not isolated entities from the rest of society, and the firms' actions have an impact on the wider range of its stakeholders, the society and the environment as a whole. Thus, firms can not only rely on profit maximization logic but should seek sustainable management (Freeman, 1984). The second theory gives an institutional perspective to why should firms adopt ESG and CRS activities. While pursuing these activities can be costly in the short run but helps to legitimize the firm's reputation and credibility among investors and creditors which can be rewarding in the long run. A legitimate firm can easily secure the necessary funds and resources vital to the firm's growth and performance (Deegan & Unerman, 2011). But this being said how do the CRS and ESG activities impact the firm's value and performance?

2.2. CRS and the firm value

A growing number of empirical literature have attempted to clarify the relationship between CSR activities on one hand and the firm's value on the other but with mixed results showing either a positive relationship (Lins et al., 2017; Phang et al., 2023), a negative relationship (Di-Guili & Kostovetsky, 2014) or neutral (Bae et al., 2021). From this empirical literature, two opposite hypotheses have emerged to try to explain the nature of the relationship. An overinvestment hypothesis based on the agency and neoclassical theory, and a conflict resolution hypothesis based on the stakeholder theory.

2.2.1. *The negative view*

The overinvesting hypothesis suggests that engaging in CRS activities is solely motivated by the manager's self-interested behaviors (Cespa & Cestone, 2007). Managers tend to increase their reputation and persona as good and engaged citizens (Bardy & Ruben, 2010). Furthermore, according to Cespa & Cestone (2007) engaging in CSR practices is a good strategy for CEOs to maintain their positions. With this in mind, managers tend to increase their CSR engagement and overinvest beyond an optimal level, reducing the firms' value. Moreover, a wide range of empirical studies show that insiders' holdings are unfavorable to the firms' CRS activities, implying that overinvesting in CRS activities is partly due to the agency problem (Lin et al., 2021; Kruger, 2015).

Following the neoclassical theory, the sole purpose of the firm is to maximize the shareholders' wealth. Friedman (1970) views the CSR engagement as a donation from shareholders to the stakeholders which can lead to a competitive disadvantage compared to unengaged companies. According to Friedman, it's not up to managers to donate on behalf of shareholders, and if shareholders wish to donate it should be from their own income. According to stockholders' theory, resources should be allocated to improving the profitability and wealth of shareholders. Any resources directed toward stakeholders decrease the firm's value.

2.2.2. *The positive view*

According to Freeman (1984), the conflict resolution hypothesis (or reputation-building hypothesis) states that CSR activities have a positive impact on firms' value "*doing well by doing good*". According to the stakeholder theory, CRS activities help to mitigate conflicts between internal and external stakeholders, improve the firm's communication with its environment and reduce conflict of interest between managers and stakeholders by improving firm's reputation. CSR can also be used to strengthen the company's branding allowing product differentiation, boosting the company's margins and reducing the information asymmetry which diminishes the risk (Albuquerque et al., 2019). Empirical studies demonstrate that CRS reduces firm's information asymmetry and thus lowers the risk premium benefitting the company from lower capital cost (Cui et al., 2016; El Ghoul et al., 2011). Based on the above discussion CSR allow to benefit from a positive valuation effect.

2.3. The CSR and the firm's performance

To date, researchers have not reached the same conclusions about the effect of CSR activities and financial performance. Some studies have shown a positive correlation, others a negative correlation, and still others no correlation.

Numerous studies have shown a positive impact of CSR activities on the firm's financial performance. Orlitzky (2001) showed that when firm size is taken as a control variable, CSR is found to be positively associated with financial performance. Simpson & Kohers (2002) investigated the relationship between CSR and financial performance in the banking sector, and the results confirm the positive connection between the two. Luo & Bhattacharya (2006) demonstrate that CSR activities allow for better financial performance in the long term. In the same way, Surroca et al. (2010) found that the formation of intangible assets impacts positively the firm's financial performance. In the same vein, Shen & Chang (2009), by relying on four matching methods, established that CSR is positively related with firms' profit margin, net sales, and pre-tax income. Pan et al. (2014) studied the relationship between CSR and financial performance in the mining industry in China and established that CSR is positively linked with financial performance. Aboud & Diab (2018) also found that ESG activities that satisfy stakeholders' interests improve financial performance. Moreover, Kang & Jung (2020) establish that ESG activities don't impact equivocally the firms' financial performance, but it depends on the firms' financial characteristics.

On the other hand, other research findings confirm the positive impact of CSR on financial performance. Using a UK corporate reputation index, Brammer et al. (2006) found a negative impact of CSR on firms' stock returns. Based on a cross-country analysis, Surroca & Tribó (2008) highlighted a negative relationship between firms' financial results and their social performance. Similarly, the work of Makni et al. (2009) identifies a strong negative impact of the environmental dimension on financial performance. The same results were found by Duque-Grisales & Aguilera-Caracuel (2021) in the case of Latin American companies.

2.4. ESG and financial performance during the crisis

Various studies had been conducted to study the effect of ESG activities during the financial crisis. A part of them demonstrated the positive impact of ESG activities on the firms' financial performance during the period of crisis. Cornett et al. (2016) establish that banks with high quality CSR activities had a higher financial performance during and after the financial crisis. Lins et al. (2017) stress that CSR activities during the crisis are associated with higher stock returns, and high-CRS rated firms had higher profitability and rapid growth during the same period. Krueger et al. (2021) found that firms with higher ESG performance are less sensitive or more resilient and recover rapidly from the aftermath of the crisis. Oikonomou et al. (2012) come to the conclusion that CRS activities were negatively correlated with financial risk.

According to Broadstock et al. (2021), in their analysis during the COVID-19 crisis, firms with high ESG scores performed better than those with low ESG scores. The event study method was used to demonstrate that ESG did, to some extent, play a key role in avoiding risk during times of crisis as opposed to times of prosperity. Using the difference in differences method to measure the moderation effect of ESG activities on firms' risk during the crisis, Albuquerque et al. (2021) demonstrated that firms with poor ESG performance showed a downside risk that is significantly greater than that of firms with excellent ESG performance. Furthermore, Diaz et al. (2021) found that the environment and society are the two key factors that can indicate the importance of risk avoidance during the COVID-19 crisis. Yamada & Takahashi (2021) determine the elements that influenced the Japanese stock market during the COVID-19 epidemic. There is no evidence that companies with high ESG scores have greater abnormal returns, but those with ESG funds do better than those without. Table I below summarizes the results of some recent studies regarding the relationship between ESG practices and firms' value.

Table 1: Summary of empirical studies on the relationship between ESG engagement and firms' value

Study	Market scope	Relationship between	CRS → company's performance	Methodology
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Tian et al. (2022)	Chinese stock market	Companies' characteristics and stock returns	Negative impact on stock return	Difference in differences
Abedifar et al. (2021)	Canada, France, Japan, the UK and the US.	Companies' characteristics and stock returns	Mixed results depend on the country	Accounting-Based Analysis
Lee et al. (2022)	Korean stock exchange	Investors type and stock returns	Positive impact on stock returns Investors liquidate lower ESG engagement companies	Event study
Yi et al. (2022)	Chinese stock exchange	Companies' characteristics and stock returns	Negative impact due to agency	Difference in differences
Qiu et al. (2021)	Chinese stock exchange	Companies' characteristics and stock returns	investors positively react to pandemic-related CSR activities	Difference in differences and event study
Mousa et al. (2021)	Arab countries	Arab stock market indexes	Positive impact on stock returns and the firms value	GARCH model
Zhou & Zhou (2021)	Chinese stock market	TobinQ, companies' characteristics and stock returns	ESG engagement has a cushion effect, lowers volatility and stronger recovery	Difference in differences
Hafez (2016)	Egyptian stock exchange	Companies' characteristics and stock returns	Significant positive relationship between CRS and stock performance	multiple linear regression
Cardillo et al. (2022)	European countries	ESG ration and death cases	ESG improves stock performance	panel data regressions
Bonnie et al. (2017)	American stock exchange	TobinQ, companies characteristics and stock returns	CSR firms has a higher firm value than non-CSR	Difference in differences
Hwang et al. (2021)	Korean stock exchange	Companies' characteristics and stock returns	ESG activities protect firms from a sharp decline in financial performance	Difference in differences
D'Amato & Falivena (2020)	European stock exchange	KLD TobinQ, companies' characteristics and stock returns	CSR affects firm value differently, depending on company size and age	Panel model
Hu et al. (2018)	Chinese stock exchange	TobinQ, companies' characteristics and stock returns	Neutral impact	Multiple linear regression
Engelhardt et al. (2021)	European stock exchange	Companies' characteristics and stock returns	higher ESG ratings firms perform significantly better during the crisis	ordinary least squares (OLS) regression

Source: Authors

In summary, current research offers ambiguous conclusions on the connection between companies' CSR or ESG engagement and stock returns during the COVID-19 crisis. Hence, we formulate the following alternative hypotheses:

Hypothesis H1a: Listed Moroccan firms with ESG engagement have higher stock returns amid the COVID-19 crisis than firms without ESG engagement.

Hypothesis H1b: Listed Moroccan firms with ESG engagement have lower stock returns amid the COVID-19 crisis than firms without ESG engagement.

Hypothesis H1c: Listed Moroccan firms with ESG engagement have stock returns comparable to those of firms without ESG engagement, during the COVID-19 crisis.

3. Data and methodology

3.1. Data

Our sample is made up of 23 listed companies in Casablanca's stock exchange between the period of March 2019 and March 2021. We begin with our treatment group which includes the ten companies of the ESG10 index. These companies are considered to be a treatment group, as they adhere to CSR activities from the point of view of the ESG10 index. For the control group, we are going to choose the other remaining companies listed in the MSI20 that are not included in the ESG10 index, i.e. companies that do not engage in CSR activities as defined by the ESG10 index. The choice of control group is largely dictated by data availability. Our sample of firms covers 83% of the total transactions in Casablanca's stock exchange. We extract data about the corporate financials and stock returns from *Eikon Refinitiv* database.

3.2. The model

In impact evaluation studies, one of the most used techniques is Difference-in-Differences. The approach, which combines before-and-after and treatment-control group comparisons, is intuitive and has been applied extensively in a variety of fields, including management, public policy, economics, and health research. The basic idea behind DiD models is that observations are collected for two groups of individuals. One group is the treatment group, which is exposed to the treatment. The other is the control group, which receives no treatment. In the absence of treatment, the treatment and control groups should in principle follow the same

trend over time. This is known as the parallel trend hypothesis. The DiD model makes it possible to assess the effect of implementing a policy by comparing the differences between the treatment and control groups before and after the policy has been implemented³.

Following Tian et al. (2022), first we employ a difference-in-difference model, which is used to investigate the impact of a policy or an exogenous event, to determine the causal relationship between CSR and stock returns during the covid-19 crisis in Morocco.

In order to compare the monthly stock returns of the control and treated groups, we use an event window of $[-12, +12]$, from March 2019 to March 2021, and estimate the following difference-in-difference regression:

$$Y_{it} = \alpha_0 + \alpha_j D_{it} + \gamma_j Z_{it} + u_i + \lambda_i + \varepsilon_{it} \quad (1)$$

The dependent variable Y_{it} is the monthly stock return adjusted by dividend which is used to determine the firm's performance while we use the monthly abnormal stock return adjusted by dividend to check the robustness of the results. Whereas the independent variable D_{it} is the treatment dummy that takes 1 if the firm belongs to the control group and to a post-covid-19 period; otherwise, it is zero. The typical treatment effect is static. We consider the lockdown on March, 2020, as an exogenous shock.

Based on the relevant literature like Clarkson et al., 2008, 2019; Lins et al., 2017; Chen et al., 2018; Zhang et al., 2020 ; Li et al., 2020 ; Ting, 2021; Albuquerque et al. (2020),_Poursoleyman et al, 2023, the Z_{it} matrix is a set of firms' characteristics used as control's variables. The reason is that these variables have been shown to influence stock returns and play a decisive role in the relationship between CSR and company performance. Firms' volatility is the stock's logarithmic rate of return over the past 250 trading days. Ownership is a dummy variable that takes 1 if the majority shareholder is a foreign investor; otherwise, it is 0. Other control variables are based on accounting data. Lev is the total liabilities

³ Like all quasi-experimental methods, the Difference-in-Differences approach measures the effect of a treatment on the treated group. However, it does not measure the effect it would have if generalized to the entire population, nor does it capture variations in effects among different treated individuals.

divided total assets. The operating cash flow to total assets ratio is used to determine *cash flow*. *ROA* is defined as the net asset to total asset ratio. *Size* is the natural logarithm of the book value of the entire assets. *BM* is the market-to-book ratio.

Second, we employ a staggered difference in difference model (dynamic DiD) to verify the pre-treatment parallel trends hypothesis:

$$Y_{it} = \alpha_0 + \sum_l \alpha_l D_{it} + \gamma_j Z_{it} + u_i + \lambda_i + \varepsilon_{it} \quad (2)$$

Where D_{it} is a series of dummies variable indexed by firm and the month relative to the covid-19 outbreak in March 2022. If no significant difference between the treated and non-treated firms occurs, therefore we assume that the parallel trend hypothesis is verified as there is no treatment effect. We use a TWFE regression model and an alternative model proposed by Sun & Abraham (2021) to test the parallel trend assumptions.

3.3. Results and discussion

3.3.1. Results of the main regression

Table II provides a summary of the key regression. The second and third columns of table II's first row employ monthly returns as their dependent variable. The average treatment effect is still statistically significant at 1% in the second column, whereas the first column simply includes additional control variables for the company and time fixed-effects. The empirical data shows that, during the COVID-19 pandemic, CSR had a considerable negative impact on stock returns. The financial performance of both control and treatment groups was negatively and significantly affected by COVID-19. However, these effects were more pronounced for the treatment group than for the control group. The average monthly returns of corporations with CSR engagement are -1.367 percent lower than those of their competitors. By using the monthly abnormal return rate, the first and third Columns show that the average treatment effects are still significant. Thus, our results are consistent with the shareholder's theory (Friedman, 1970).

Table 2: The effects of ESG engagement on stock return according to diff and diff regression

Dependent variable			
Abnormal return (1)	Normal return (2)	Abnormal return (3)	Normal Return (4)

D_{it}	-0.567* (0.309)	-1.367*** (0.371)	- 0.773* (0.456)	-1.423*** (0.468)
ROA	-0.019 (0.091)	0.008 (0.092)		
Lev	-1.585 (0.756)	-1.703** (0.800)		
Volm	-15.272 (13.464)	-13.570 (12.568)		
BM	-1.934*** (0.172)	-2.044*** (0.170)		
Cashflow	-0.597 (1.080)	-0.522 (1.100)		
Size	-0.089 (0.136)	-0.143 (0.136)		
Ownership	-0.780** (0.375)	-0.705 (0.382)		
Constant	2.094** (2.643)	1.950** (0.892)	0.446 (0.317)	0.592** (0.316)
Observations	552	552	552	552
R²	0.027	0.019	0.002	0.005
Adj R²	0.012	0.005	0.001	0.003
Residual Std. Error	6.297 (df = 543)	8.010 (df = 543)	6.335 (df = 549)	8.017 (df = 549)
F-Statistic	1.859* (df = 8;543)	1342 (df = 8; 543)	1.295 (df = 2;549)	2.736 (df = 549)

Note: *, **, *** represent the significance at 1%, 5% and 10% respectively.

Source: Authors

Furthermore, according to the agency theory, which argues that agency issues drive managers to overinvest in pricey CSR initiatives for their own purposes, CSR had a detrimental influence on stock returns during the crisis. Overinvestment may have put businesses in poor financial conditions when the COVID-19 pandemic unexpectedly occurred, which limits businesses' ability to operate during the crisis and recover from it. Investors respond more harshly to companies with CSR activities because they anticipate these repercussions (Johnson et al., 2000).

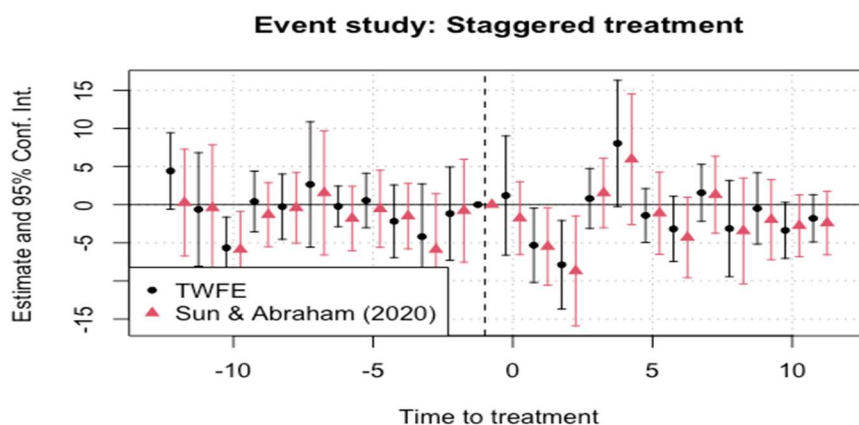
A significant drop in asset value during the crisis makes agency issues more acute, leading to extensive credit rationing and significant reductions in all sorts of investments (Bernanke et al., 1999). Almeida et al. (2012) uncover empirical proof of the sharp decline in business investment that followed the start of the 2008 financial crisis. Therefore, without adequate supervision, the costs of CSR overinvestment during a financial crisis, when financial resources become more precious, can outweigh the benefits of conflict resolution. In other words, the deployment of CSR programs wastes valuable firm resources and causes a decline

in firm value during the crisis without adequate monitoring and external corporate control. Thus, negatively impacting the firm's value and stock performance. According to our results, CSR performance does not increase corporate resilience to COVID-19 exogenous shock.

3.3.2. Results of the dynamic regression

This section looks at how CSR changed both before and after COVID-19. Using a dynamic difference in differences regression, we then explore the dynamic impacts of ESG engagement pre and after the COVID-19 crisis. Figure I shows the dynamic effects of CSR together with associated confidence intervals by using a TWFE model and Sun and Abraham (2021) correction. The two regressions show that the pre-treatment coefficients are statistically insignificant, demonstrating that there is no significant treatment effect between the treatment and control group thus suggesting that the parallel trend hypothesis holds for our case. In contrast, their stock returns dramatically diverge after the incident, and the differences last for 5 months before they converge once again after the 5th month.

Figure 1: The dynamic effect of CSR on stock return



Source: Authors via R

The results demonstrate that Moroccan's stock market is unable to positively value CSR activities. This finding is not in line with the resiliency hypothesis involving that firms that engage in CSR activities are more resilient in periods of crisis. Some explanation may confirm this result. The first one stems from the agency theory which implies that Moroccan managers, who are motivated by their self-interest, tend to overinvest in costly CSR activities. As a result, the stock

market returns of companies decline during the pandemic. The second one is that the CSR practices are part of a long-run strategy; hence they can only have a positive long-run impact on a company's financial performance. Thus, the effect is non-linear, initially negative (cost of CSR activities), and then reverses from a certain level or in the long-run, which finally improves stock returns. A third possible explanation is that Morocco is a small emerging economy that has not yet reached the stage of development where CSR practices will be appreciated. Ding et al. (2021) showed that CSR activities enhance firm resilience in economies that value them highly and where social norms place a high value on the human rights and the environment. In these economies, CSR is more likely to boost loyalty and improve stakeholder relations.

Our findings are inconsistent with studies of Ding et al. (2021) and Albuquerque et al. (2020), Broadstock et al. (2021) and Phang et al. (2023) who claimed a positive impact of CSR activities on stock returns. However, they are in line with the results of Tian et al. (2022), Yi et al. (2022), and Nirino et al. (2022) who established that CSR activities worsen the stock performance of Chinese firms. Indeed, this study contributes to the intense debate on the role of CSR activities in firm resilience.

3.3.3. Robustness checks

The crucial assumption of DiD models is the presence of parallel trends. Violation of this assumption is likely to bias the identification of the causal effect of a treatment. We use a TWFE regression model and an alternative model proposed by Sun & Abraham (2021) to test the parallel trend assumptions. The two estimated regressions showed that the pre-treatment coefficients are statistically insignificant, suggesting that the parallel trend hypothesis holds for our case. This is also confirmed with the introduction of exogenous control variables⁴.

4. Conclusion

By the end of February 2020, an exogenous shock caused by the COVID-19 pandemic triggered the fastest stock market decline in history. We exploit this

⁴ To reinforce the robustness of the results, we can also use a placebo test by replacing the control group with another similar control group. But unfortunately, lack of data prevented us from carrying out such a test.

unprecedented period to study the influence of CSR activities on the financial performance of listed Moroccan firms during this crisis. The unpredictable nature of this event provides the researcher with an interesting opportunity because firms did not have enough time to react and, as a result, their resilience depends solely on their previous strategic decisions. We reveal that the pandemic-caused decline in stock returns is more pronounced for companies that engage in CSR activities. It means that engaging in CSR activities does not immunize Moroccan firms during the pandemic. This result is not consistent with the resiliency hypothesis which states that companies that engage in CSR practices are more resilient in times of crisis. So, Moroccan's stock market is unable to positively value CSR activities.

A possible explanation for this result relates to the agency problem. According to agency theory, Moroccan managers, guided by their own self-interest, tend to overinvest in costly CSR activities, which has hurt the stock market performance of Moroccan companies during the COVID crisis and impeded their recovery afterward. This can also be explained by the non-linear effect of investment in CSR activities on financial performance and by the fact that these practices are relatively recent in Morocco so that they are not yet appropriated by investors.

Although CSR activities are detrimental to companies' financial performance, this impact is likely to be reversed as these activities become more visible and developed. Managers therefore need to become more involved in CSR activities, strengthen the quality of responsible investment and raise investor awareness of the importance of these activities.

The study has focused only on listed firms. It would be more interesting to expand the sample to unlisted companies in future research in order to get a complete picture of the connection between CSR activities and the performance of Moroccan firms.

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Geometric mean approach to measure Composite Index

Abordagem média geométrica para medir o Índice Composto

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Abstract: Composite Index (CI) maps selected n -indicators to real line. Existing measures of CIs suffer from limitations. In addition to selection of component indicators, other areas of CI receiving heavy criticism are normalization, weighting and aggregation. The paper proposes CI as geometric mean (GM), avoiding scaling, weighting and outliers with no bias for either developed or under-developed countries. Proposed CI can cover indicators in ordinal or ratio/interval scale or those in percentages and depicts overall improvement/decline in the current year from the base year or from the previous year by a continuous, monotonically increasing function. It helps in better comparisons of countries across time and space, identification of key areas, plotting growth of CI of a country using well defined chain-indices. The index with wide applicability can be used for better ranking, estimation of population parameters and testing statistical hypothesis. Separate indices for dimensions can be constructed by considering indicators relevant to a domain. Future studies suggested.

Keywords: Composite index; Monotonically increasing; Geometric mean; Time-reversal test; Chain indices.

Resumo: O Índice Composto (IC) mapeia n -indicadores selecionados para uma linha real. As medidas de IC existentes sofrem de limitações. Para além da seleção dos indicadores componentes, outras áreas do IC que têm sido alvo de fortes críticas são a normalização, a ponderação e a agregação. O presente documento propõe que o IC seja a média geométrica (MG), evitando o escalonamento, a ponderação e os valores anómalos, sem enviesamento, tanto para os países desenvolvidos como para os em desenvolvimento. O IC proposto pode abranger indicadores em escala ordinal ou de rácio/intervalo ou em percentagens e representa a melhoria/declínio global no ano em curso em relação ao ano de referência ou ao ano anterior através de uma função contínua e crescente. Ajuda a melhorar as comparações de países no tempo e no espaço, a identificar áreas-chave, a traçar o crescimento do IC de um país utilizando índices em cadeia bem definidos. O índice, com uma ampla aplicabilidade, pode ser utilizado para uma melhor classificação, estimar parâmetros populacionais e testar hipóteses estatísticas. Podem ser construídos índices separados para as dimensões, considerando indicadores relevantes para um domínio. Sugerem-se estudos futuros.

Palavras-chave: Índice composto; Aumento monotónico; Média geométrica; Teste de inversão temporal; Índices em cadeia.

JEL classification: C43, O15

1. Introduction

Composite Index (CI) combines measures of several indicators on economic, social, environmental variables, government initiatives, wellbeing of health, psychological, satisfaction of basic needs, social/cultural, etc. Large numbers of CIs have been developed for measuring complex overall performance for comparing entities and orienting policy-decisions. CIs are being used for policy makers, academics, etc. in various areas like Economics, Social sciences (OECD, 2008), Economic Freedom Index (Johnston and Sheehy, 1995), Poverty Index (OPHI, 2018), Well-being and quality-of-life (Cendrero et al. 2003), and in other areas like Logistics Performance Index (LPI) (Arvis et al., 2016), Environmental Sustainability Index (ESI) (World Economic Forum, 2002), Life cycle index (Khan et al., 2004), Corruption Perceptions Index (Lambsdorff, 2006), etc. European Parliamentary Research Service (EPRS) (2021) selected following 10 CIs to support policy makers:

- Climate Change Performance Index (CCPI) (www.germanwatch.org/en/ccpi_bame): Assesses countries' efforts to combat climate change and reduction of greenhouse gas (GHG) and to evaluate a country's compatibility with the Paris Agreement goals. Each of 14 indicators of CCPI, distributed over four dimensions is converted to a 0-100 scale. However weights of individual indicator varies from 10% (for on GHG emissions, Climate policy) to 5% for each indicator under Renewable energy; Energy used. CCPI uses overall EU target and not the targets of the Member States, different baseline year for different countries and relative GHG emission reduction targets which gives rise to positive or negative skews.

- Commitment to Development Index (CDI): Combines six components to assess contribution of 40 countries to global development, with emphasis on improved 'footprint'. Inclusion of OECD countries (with sound reporting systems) and non-OECD countries in CDI has generated data gaps, mitigation of which is problematic (Birdsall and Roodman, 2003).

- Ease of Doing Business Index (EoDBI): Has 41 indicators grouped in 10 equally weighted topics. EoDBI measure regulations directly affecting businesses. EoDBI has been criticized for not considering social and human rights situations in

the countries. The World Bank conducted an internal audit in 2020 for rectification of flawed data and suspended the 2021 edition (Djankov, 2016)

- Ecological Footprint (EF): Finds how much biologically productive land and water an individual, population or activity requires producing all it consumes including absorption of the generated wastes. Five sub-components common to EF and bio-capacity are (cropland, grazing land, built-up land, fishing grounds, forest areas). In addition, EF also considers carbon footprint. Ecological deficit occurs when the footprint of a population exceeds the bio-capacity of the area available to that population. Major criticisms of the EF are over-focus on forests and covering only part measures of sustainability and not exhausting all dimensions of environmental quality (Wackernagel, 1996).

- EU Regional Competitiveness Index (RCI): With 74 indicators, RCI measures differences in regional competitiveness across Europe with focus on major factors of competitiveness. RCI, with a broad set of indicators tracks ability of a region to provide an attractive environment for businesses and residents to live and work. It is based on Global Competitiveness Index (GCI), which monitors competitiveness at national level (Annoni & Dijkstra, 2017).

- EU Social Progress Index (EU-SPI): Considers 55 indicators on health, education, safety, environmental quality and personal rights which are grouped into three dimensions. The selected dimensions may not be sufficient to achieve social progress as a whole. It uses hybrid aggregation method, unweighted arithmetic mean within each component and generalized unweighted mean across components and dimensions (Beltrán-Esteve et al. 2023).

- Human Development Index (HDI) (UNDP, 2010): HDI aggregates three chosen dimensions at country level by geometric mean without showing inequalities in a particular country.

- Media Pluralism Monitor Index (MPM): MPM attempts to assess the potential weaknesses in national media systems that may not be conducive for media pluralism. Through a questionnaire consisting of 200 questions on 20 indicators, it covers four dimensions. There is no overall score (Brogi, 2020).

- Normandy Index (NI): Attempts to measures level of threats to peace, security and democracy based on interconnectedness of threats and linkages between such threats. Despite certain weakness, NI demonstrates some positive evolution, in particular the sustainable convergence of some countries in the

European neighborhood. NI complements the annual Peace and Security Outlook produced by the European Parliamentary Research Service (EPRS).

- Sustainable Development Report's SDG Index: Provides an assessment of progress made towards the SDG goals by all UN Member States. The Report includes scores on a scale of 0 to 100 and can be interpreted as a percentage towards optimal SDG performance. Therefore, the difference between 100 and a country's SDG Index score is the distance, in percentage points, that must be overcome to reach optimum SDG performance. Major limitations are significant missing data, equal weights, different number of indicators for different SDG-goals and normalization by Min-Max transformation (Lafortune et al. 2022)

Different CIs with different purpose differ in number of items, item formats; scoring methods, dimensions covered, etc. and thus, CI-scores are not comparable. Lower rank of a country with respect to a CI-value has often been debated since CIs are used as documentary evidence of success of policies adopted by national governments. Properties of CI, values and country-ranks are affected by the changes in methodology (EPI Report, 2016). Two areas receiving heavy criticism are weighting and aggregation (Greco et al. 2019)

Stages of construction of CI are (i) Selection of indicators and domains. (ii) Scaling or normalizing raw data and (iii) Aggregation of transformed scores to get a single value of CI. Lack of agreements at each stage of construction of CI makes such indices useless if not misleading (Böhringer and Jochem, 2007). For a set of chosen variables or indicators $X_1, X_2, \dots, X_n$, CI finds a function f where the vector $(X_1, X_2, \dots, X_n)^T$ is mapped on the real line. The value of the function indicates the overall position of a country/region based on which the countries may be compared across time and space. Evaluation of such a function $f: R^n \rightarrow R$ i.e. from n -dimensional space to real line involves a sound methodological approach which is critical for better comparisons and ranking in terms of combined measure of social, economic, political, environmental areas (Freudenberg, 2003). The selected indicators are measurable and reflect levels of achievement of components or dimensions/drivers of the Index in question expressed by objective and also subjective measures. In general, indicators are in different units, discrete or

continuous, interval/ratio scale or categorical, independent or correlated with different degrees. The chosen indicators (X_i 's) could be positively related to CI, where higher $X_i \Rightarrow$ higher CI or negatively related where lower the $X_i \Rightarrow$ higher the CI. Aggregating such positive and negative variables may require prior adjustments. Variations in stages of construction of CI may impact significantly values and properties of the resultant CI, affecting quality and appropriateness of such indices even for the same purpose. Jacob, et al. (2004) observed that methodological issues associated with construction of CI give rise to potential manipulations and misinterpretations and suggested to address issues like reliability, validity, appropriateness of such CIs.

The paper describes major methodological issues regarding construction of CI and suggests an assumption free method of CI avoiding scaling, weighting and reducing level of substitutability among the component indicators. Properties satisfied by the proposed CI and benefits are deliberated.

2. Stages of construction of CI:

2.1 Selection of dimensions, indicators:

The selected indicators within a dimension should be relevant to the purpose for which CI is being developed. “Hedonic” measures focuses on the “feeling” components (e.g. happiness) in contrast to “eudaimonic” measures which focuses on the “thinking” components (Ryff and Keyes, 1995). A narrow selection of indicators may fail to represent the overall picture as conceptualized by the CI in question. Broad selection of variables is likely to increase the problems of multicollinearity and complexity in transforming data and aggregation. Greco, et al. (2019) opined to enlarge the range of indicators for constructing CI

Examples of CI with small number of variables include Measures of America containing three domains and four indicators. HDI uses six items. LPI uses six number of 5-point Likert items to assess six dimensions of trade. Overall Life Satisfaction (International Wellbeing Group, 2013) with a single item gives poor discrimination and makes internal consistency reliability inappropriate. Examples of CIs with large number of indicators include: Worldwide Governance Indicators project considered over 300 indicators and 33 data sources (Kaufmann, et al. 2007).

Quality of Life (QOL) with 100 items covers six main domains (WHOQOL-100). Health-related quality of life (HRQOL) includes number of areas associated with well-being. Patient-Reported Outcomes Measurement Information System (PROMIS) considers large number of self-reported items covering multiple HRQOL domains (Cella et al. 2019). The 10-item global HRQOL assesses selected domains of physical/mental/social health including pain, fatigue and perceptions of QOL. Social Progress Index (SPI) combines 51 social and outcome indicators to calculate overall score for countries (www.socialprogressindex.com/methodology).

CIIs have been criticized for not considering all relevant dimensions or indicators. OECD Better Life Initiative (BLI) (www.oecd.org/betterlifeinitiative) covers 11 domains, but ignores usual air–water–noise pollutions and may not fully capture what is truly important for the CI. Kasparian and Rolland (2012) suggested inclusions of more number of variables in BLI. Gross National Happiness (GNH) with nine equally important domains and 33 indicators was later modified to include 72 indicators (www.grossnationalhappiness.com). Canadian Index of Wellbeing (CIW) with 8 indicators for each of the 8 domains ignores subjective Well-being (Michalos et al. 2011). Happy Planet Index (HPI) (www.happyplanetindex.org) ignores QOL, income equality, literacy rate, abuse and violation of human rights, environmental issues, etc. EU's Quality of Life Index (Distaso, 2007), National Accounts of Wellbeing (NEF, 2008) ignore environmental issues, time use and extent of meeting human needs like shelter, safety, security etc.

High correlations between component variables imply multicollinearity, which is inevitable in CI (Smith, 2002). High correlation of one variable with CI implies no need of multidimensional CI and instead the former could well be used (McGillivray and White, 1993).

2.2 Nature of data

Depending on the purpose, CI may consider population-based data and also primary data obtained from survey using (say) self-reported Likert scales or rating scales. Orff, et al. (2007) observed that self-reported insomnia differ with objective evidences of sleep disturbance. Data generated by Likert/rating scales are discrete and ordinal where items may have equal or different number of levels or

combination of k-point scales ($K = 3, 4, 5, 7$) plus Yes –No type binary items like SF-36 (Ware & Sherbourne, 1992). SF-36, CIW, Wellbeing index by ElSarawy, (2016) transforms raw data to percentages before taking average. However, average of percentages is wrong, when the denominator $d_i \neq k * d_j$. Pooled average of 80% (8 out of 10) and 40% (4.8 out of 12) is 58.18% which is different from average of 80% and 40%. Similarly, actual value by a country (in %) – minimum value in a group of countries (in %) could be problematic. To combine percentage figures, Human Poverty Index (HPI) (UNDP, 2007) first finds average of figures (in percentage) and then takes 3-rd root and 4-th root of such average, to get respectively HPI-1 and HPI-2. Happiness surveys often results in negative and positive happiness which are subjectively determined by the respondents. SPI contains around 50 indicators of which one is ordinal (from 0 to 6). HPI considers Life expectancy (secondary data), and experienced wellbeing (Survey based with one item from 0 to 10). Personal Wellbeing Index (PWI) has seven Likert items, each with 11 levels, plus another item on ‘spirituality or religion’ (International Wellbeing Group, 2006). Combining secondary data and Likert scores could be problematic.

2.2.1 Problems with Polytomus items:

- Ordinal scores from Likert/Rating scales are not additive as they are not equidistant (Hobart et al. 2007)
- Equal importance to the items is not justified since items show different values of correlations with total scores, correlations between a pair of items and factor loadings.
- Arithmetic mean (AM) requiring equidistant scores are not meaningful for ordinal item scores (Jamieson, 2004) and $\bar{X} >$ or $< \bar{Y}$ is meaningless (Hand, 1996). If addition is not meaningful, standard deviation (SD), correlation, Cronbach α , etc. are not meaningful and analysis like regression, Principal component analysis (PCA), Factor analysis (FA), etc. with ordinal item scores may result in distorted results.
- Mean, SD, skew, kurtosis of scales get distorted if “Zero” is used as an anchor-value of Likert items (e.g. SPI, PWI, Insomnia Severity Index (ISI)). Better

could be to assign positive integers 1, 2, 3 ... and so on to the levels avoiding zero, without disturbing nature of data.

- Summative Likert scores often generate tied scores and cannot discriminate the subjects with tied scores.
- Distribution of item scores and test scores are not considered to compute summative Likert scores.
- Mean and SD of Likert scales with K -number of levels ($K=3, 4, 5, \dots$) increase as K increases (Finn, 1972) and may affect item/test parameters (Lim, 2008).

2.3 Transformation/normalization

Raw scores of selected variables in different units are usually scaled to have unit free values before aggregation. However, different methods of normalization can affect the CI. Kovacevic (2011) found $r_{Life\ expectancy, HDI} = 0.92 > r_{Life\ expectancy, GDP} = 0.71$. The inequality got reversed on taking logarithmic transformations. Illustrative methods of normalization in CI are:

- i) Normalization to have equal score ranges by Min – Max function like

$$Z = \frac{X - X_{Min}}{X_{Max} - X_{Min}} \text{ where } 0 \leq Z \leq 1.$$

Example: HDI, City Development Index (CDI), etc. It depends heavily on X_{Max} and X_{Min} and changes in X_{Max} or X_{Min} will change Z -scores and country rankings. Clearly, Z -score is relative to performance of others, Gain in Z due to unit increase in X varies for different values of X . If each indicator is improved uniformly by one unit, Z -scores and $CI = \sum Z_i$ may remain unchanged. If the variable is in ratio scale, it has a non-arbitrary fixed zero point. Such zero-point gets altered by Min – Max function.

- ii) Standardizing by $Z = \frac{X - Mean(X)}{SD(X)} \sim N(0, 1)$ has been used in CIs like ESI,

WHO index of health system performance (SPRG, 2001), etc. Mazziotta-Pareto Index (MPI) (2013) defines standardized matrix Z as

$$Z_{ij} = 100 \pm \frac{(S_{ij} - \bar{X}_i)}{S_{X_j}} \cdot 10$$

where the sign is “+” if the indicator is a positive dimension and “–” for negative dimension.

iii) $Z_i = \frac{X_i}{\bar{X}} \times 100$. It is also affected by outliers.

iv) $Z_i = \frac{X_i}{X_{Max}} \times 100$. This again depends on X_{Max} . Scores of each of 11 dimensions of BLI are normalized by relative score and not absolute measurement and thus, comparison of two countries may not be meaningful since their respective performances on each indicator depend on performances of all other countries.

v) For longitudinal data, assuming elimination of cyclical variability, standardization is done by:

$$Y_i^t = \frac{X_i^t - X_i^{t-1}}{X_i^t} \text{ where } t \text{ denotes time period}$$

Such standardization was used to assess potential benefits of the European internal market (European Commission, 2001).

vi) Logarithmic transformation by $Y_i = \ln(X_i)$. CDI, SPI used such transformation for some indicators using natural log, while other indicators are in percentages.

vii) Percentage distance from base period: For a longitudinal data on year $t_0, t_1, \dots, t_k$ CIW computed percentages $\frac{t_0}{t_0} \times 100$, $\frac{t_1}{t_0} \times 100$, $\frac{t_2}{t_0} \times 100, \dots, \frac{t_k}{t_0} \times 100$ for each chosen positive indicator/dimension. For negative indicators/dimensions, standardization were done by taking transformation as $\frac{t_0}{t_0} \times 100$, $\frac{t_0}{t_1} \times 100$, $\frac{t_0}{t_2} \times 100$ and so on. Average of all such transformations was taken as CIW score of each year ensuring $CIW = 100$ for t_0 . Considering n -indicators of which n_1 positive indicators and n_2 negative indicators, and assigning equal importance, CIW is computed by

$$CIW = \frac{1}{n} \left[\left(\sum_{i=1}^{n_1} \frac{X_i^t}{X_i^0} \times 100 \right) + \left(\sum_{j=1}^{n_2} \frac{X_j^0}{X_j^t} \times 100 \right) \right].$$

However, such non-linear transformations distort trends of the data. Addition of figures in percentages may give wrong results in construction and interpretation of CI as can be seen from the Table – 1 containing hypothetical data involving one positive indicator and one negative indicator where each indicator registered increasing trend:

Table -1**Illustrative CIW scores based on hypothetical data**

Year	Original data		Transformed data using formula of CIW		Average
	Positive indicator	Negative indicator	Positive indicator	Negative indicator	
0	104	22	100	100	100
1	107	22.4	102.8846	98.21429	100.5495
2	114	24.3	109.6154	90.53498	100.0752
3	117	25	112.5	88.0	100.25
4	120	26	115.3846	84.61538	100
5	123	26.5	118.2692	83.01887	100.644

Clearly, CIW is not monotonic. Different methods of scaling/normalization may affect CIs differently. Thus, it is desirable to construct CI avoiding normalization.

2.4 Aggregation of the indicators:

Aggregation of indicators may have major implications for the CI. Various CIs used variety of aggregation methods. Addition of indicators assumes measurements are in interval or in ratio level and indicators are equally important i.e. perfect substitutability among the indicators, which can be criticized for arbitrariness. Perfect substitutability implies low value of an indicator can be compensated by high value of another indicator. ESI (2002) used simple AM. Dimension score of CWI is obtained by AM despite the indicators are in percentages and giving equal weights to the dimensions. ElSarawy (2016) also used average of normalized values in percentages of the domains. MPI used AM of normalized variables as $MPI_i^{+/-} = Mean_{Z_i} (1 \pm CV_i^2)$ where CV_i denotes coefficient of variation of the i -th indicator.

Here, sign of MPI_i depends on nature and direction of individual indicators. Higher mean and lower SD $\Leftrightarrow$ MPI is high.

2.5 Weighted sum approach

Here, $CI = \sum_{i=1}^n W_i X_i$ where $0 < W_i < 1$ and $\sum_{i=1}^n W_i = 1$ (Example: EPI). For CDI, Wellbeing Index (WI), Human Well-being Index (HWI), Ecosystem Well Being Index (EWI), $CI = \frac{1}{n} \sum_{i=1}^n W_i X_i$

Selected weights could be proportional to perceived importance and indicate ‘trade-off’ between pairs of criteria. $\frac{W_1}{W_2}$ may be interpreted as the amount to be sacrificed by indicator-2 to gain an extra unit of indicator -1. Changing weights to indicators affect CI of the countries being evaluated (Saisana et al. 2005) and can manipulate country rankings (Grupp and Schubert, 2010).

Appleby & Mulligan, (2000) decided weights to the indicators based on public preferences, but sum of the six weights exceeded unity and weight for one indicator was negative. $\sum_{i=1}^n W_i \neq 1$ violates the convex property of measurement and properties of CI as weighted sum are not known. Approaches to select weights to the indicators are: normative (subjective weights), data-driven and hybrid (Decancq and Lugo, 2013). PCA weights were used by SPI, internal market index in EU countries (European Commission, 2001b), composite sustainability indicators (Li, et al. 2012), etc. However, PCA weights ignore indicators which are poorly correlated with the CI even if they are practically important. Moreover, PCA deals with normally distributed scores, violation of which distorts results. For covariance matrix, PCA gives more weight to variables with larger variances. PCA weights are data specific and may vary across time. PCA approach to weighting was found inappropriate in constructing CI to measure business climate by OECD and the index of environmental sustainability (WEF, 2002). Use of PCA is not favoured by ESI 2002. For Economic Sentiment Indicator and index of environmental sustainability, PCA and FA failed (Nardo et al. 2005). Sava (2016) found PCA weights for data accumulated for 11-years which were different from the PCA weights found after averaging year-wise data. LPI Report 2014 used PCA weights where sum of weights > 1 .

No weight or equal weights are wrong (Greco et al. 2017; Mikulić et al. 2015). Equal weights treat equally the essential indicators and less important indicators. It assumes a constant trade-off rate between each pair of criteria (Tofallis, 2014). GNH assigned 50%, 40%, 33%, 30%, 20%, 17% and 10% weights to indicators under each dimension but weights to the dimensions were equal. Subjective indicators have been given lower weights than objective indicators. HPI attempts to combine human well-being and environmental impact gives high weights for the carbon footprint. Thus, HPI is higher for countries with lower ecological footprints which try to measure human demand on nature is a much-criticized concept. Hartung et al.(2008) mentioned about ideal weights. Chakrabartty (2017) found the weight vector $W = (W_1, W_2, \dots, W_n)^T$ satisfying $\sum_{i=1}^n W_i = 1$ and minimizing variance of the weighted sum $Y = \sum_{i=1}^n W_i X_i$. The author proved that if $X_1, X_2, \dots, X_n$ are replaced by standardized scores $Z_{ij} = \frac{x_{ij} - \bar{x}_j}{s_{x_j}}$, then Y is equi-correlated with each $Z_i \forall i = 1, 2, \dots, n$. However, determination of methodologically sound weights for computation of CI as weighted sum is a difficult task (Yang et al.2018) and there is no weighting system which is beyond criticism (Greco, et al.2019).

2.6 Methods other than weighted sums:

Ease of doing business computes distance to frontier score from 12 areas of business regulations and aggregates such distances (Meng et al. 2013). But distance may not be invariant under change of scale. Blancard and Hoarau, (2013) obtained CI using data envelopment analysis (DEA), to develop an efficiency frontier by optimizing the weighted output/input ratio, ensuring that this ratio ≥ 1 . However, DEA results vary with changes in number of input variables and output variables. The best specification cannot be tested. DEA cannot be applied directly where indicators are outputs, with no data on inputs (Herman, 2008). Moreover, countries differ in policy goals for different areas and use of resources and thus, create problems in computation of weights.

Yang et al. (2018) developed model to have a common set of weights for constructing growth potential index for emerging market, using DEA approach which performed equally to the average of each indicator transformed to Z-scores (a reference point) and derived efficiency scores by minimizing the sum of the

differences between the countries that are above average and those that are below average. The model suffers from limitations of DEA models. Fusco (2015) proposed Directional Benefit-of-Doubt using DEA and PCA. CI by this approach is heavily affected by outliers, like DEA and PCA approaches.

Multiple Linear Regressions presumes linear relationship of the dependent variable and the set of independent variables, which is rather rare with CIs (Saisana et al. 2005). Moreover, the dependent variable is not observable. Porter and Stern (2001) considered logarithmic transformation of the dependent variable in the National Innovative Capacity Index. Ács et al. (2014) proposed ‘penalty for a bottleneck’ for penalizing unbalances in the CI. Here, ‘penalty’ amount depends on the data set, presence of outliers and thus, the solution is not always optimal. Tarabusi and Guarini (2013) addressed penalization of the unbalances in CI using mean–min function. However, estimation of parameters of the model for proper penalization is an issue.

GNH is calculated as $(1 - H_n A_n)$ where H_n denotes percentage of “Not-yet-happy” people and A_n denotes percentage of dimensions in which H_n – people enjoy sufficiency. Higher GNH $\Rightarrow$ greater happiness. Computation of HPI involves Atkinson Index of experienced wellbeing, Life expectancy, Ecological footprints and four other parameters. However, Atkinson inequality index (Atkinson, 1970) assumes higher the mean income, higher the social welfare and is influenced heavily by country-level socio-ecological indicators like output per worker, number of pensioners, proportion of persons with secondary education and above, etc. Moreover, measures of life-span inequality do not distinguish between healthy and unhealthy years of life (Murray et al. 1999) and weak positive associations between Gini’s measure of income inequality and Atkinson index of Life expectancy across all ages and weak negative associations among those aged ≥ 65 suggest no association between income inequality and lifespan inequality (Hertog, 2013).

HDI has shifted from arithmetic aggregation to geometric aggregation from 2010 and thus avoided perfect substitution across dimensions (UNDP 2010). Living Planet Index by Loh, (2002) also uses geometric aggregation considering ratios of indicator at successive time periods.

Just like no consensus of perfect weighting scheme, no perfect aggregation scheme is there (Arrow and Raynaud, 1986). Tofallis (2014) addressed the issues of additive aggregation and also multiplicative aggregation and favoured the later to avoid pitfalls of the former. Segovia-González and Contreras (2023) proposed geometric aggregation to evaluate gender effect in educational systems of OECD countries. McDonnell et al. (2023) reviewed methodologies at each stages of development of CI for quality and safety in healthcare and found no universally agreed approach on the design, development and reporting of such CIs.

3. Proposed method

Ignoring the stage of selection of indicators, the proposed method of CI avoiding scaling and selecting weights are described below:

3.1 Pre-processing of data

I: Ensure that increase in each selected indicator increases CI. For negative indicator, if any, consider reciprocal of values.

II. Mark the levels of items as 1, 2, 3, 4, 5, and so on avoiding zero

3.2 Method

For a country, let value of the i -th indicator at t -th time be $X_{it} > 0$ $\forall i = 1, 2, \dots, n$ and value of the same indicator in the base period be X_{i0} . The unit free ratio $\frac{X_{it}}{X_{i0}}$ reflects progress or decline with respect to the i -th indicator at t -th time period in comparison to the base period. CI for the country at the current time-period is proposed as the Geometric mean of the ratio $\frac{X_{it}}{X_{i0}}$

$$CI_{c0} = \sqrt[n]{\frac{X_{1c} X_{2c} \dots X_{nc}}{X_{10} X_{20} \dots X_{n0}}} \quad (1)$$

$$\text{or avoiding the } n\text{-th root, } CI_{c0} = \frac{X_{1c} X_{2c} \dots X_{nc}}{X_{10} X_{20} \dots X_{n0}} \quad (2)$$

CI_{c0} exceeding one, as per equation (2) implies overall improvement registered by the country from the base year. Similarly, $\frac{CI_{it}}{CI_{i(t-1)}} > 1$ indicates the progress in period t over the previous period. For two successive time periods, critical indicators are those with $\frac{X_{it}}{X_{i(t-1)}} < 1$ and can be ordered for policy purpose to decide appropriate action. Each of (1) and (2) can cover all indicators measured in ordinal

scale or ratio/interval scale or those in percentages and depicts overall improvement/decline in the current year from the base year by a unit-free function which is continuous and monotonically increasing. Growth of CI on year-to-year basis can be obtained by considering the previous year instead of the base period.

Properties of CI by equation (2):

1. Unaffected by change of scale in one or many indicators
2. Possible to plot curve showing percentage gain in the i -th indicator and corresponding percentage gain in CI.
3. Avoids scaling, selection of weights and significantly reduces substitutability among the component indicators.
4. Avoids effect of outliers implying no bias for either developed or under-developed countries
5. Satisfies time-reversal test since $CI_{t0} \cdot CI_{0t} = 1$
6. Facilitates formation of chain indices since $CI_{20} = CI_{21} \cdot CI_{10}$. This helps to plot path of a country to achieve overall progress across time which may help in inter-regional comparisons.
7. Facilitates construction of dimension-wise indices considering indicators relevant to that dimension. Aggregation of dimensions to get CI requires no selection of weights.
8. Easy to find relative importance of each indicator.
9. Facilitates estimation of population GM , since $\log GM = \frac{1}{n} \sum_{i=1}^n \log Y_i$

where $Y_i = \frac{X_{it}}{X_{i0}}$ Geometric standard deviation (GSD) (S_{GM}) is given by

$$\log S_{GM} = \left[\frac{1}{n} \sum_{i=1}^n (\log Y_i - \log GM)^2 \right]^{\frac{1}{2}}$$

Thus, $\log (\text{GSD of } Y_1, Y_2, \dots, Y_n) = \text{SD of } \log Y_1, \log Y_2, \dots, \log Y_n$

For large sample, population estimate of GM is sample GM and estimate of standard error of the GM is $GM \cdot \left(\frac{\log S_{GM}}{\sqrt{n-1}} \right)$. Confidence interval of GM for $(1 - \alpha)$ % are (e^U, e^L) where $U = \log GM + S_m \cdot t_{(\frac{\alpha}{2}, df)}$ and $L = \log GM - S_m \cdot t_{(\frac{\alpha}{2}, df)}$ (Alf and Grossberg, 1979).

Thus, $H_0: CI_{ti} = CI_{tj}$ for two different countries i and j or $H_0: CI_{ti} = CI_{(t-1)i}$ for the i -th country can be tested by t -tests using logarithms of the observations.

3.3 Benefits

- The proposed CI is applicable even for skewed data for two different time periods. Thus, it facilitates meaningful comparison of a set of regions/countries.
- Sub-groups of a country like ethnic groups, economically/socially backward groups, elderly people with specific morbidity, etc., can be compared by the proposed index with pre-determined indicators.
- Can be well used for classification of countries.
- The plot of progress/decline of CI over time helps to find impact of various socio-economic measures adopted over time.

4. Limitations:

In case a new indicator is induced subsequently, values of the new indicator need to be estimated since the base period. GM fails if value of an indicator ≤ 0

5. Conclusions:

The existing methods of measuring CI have several disadvantages. The proposed CI as function of geometric mean avoids scaling, weighting and compensability inherent in the linear aggregation setting. It can consider all chosen indicators and corresponding dimensions to reflect overall improvement/decline of a country in current year from the base year or previous year. Thus (2) avoids the criticisms on weighting, aggregation and possibly selection of indicators. It helps in undertaking statistical tests to infer significant difference if any, in overall improvement between a pair of countries at a given time period or a region/country at two different time periods. In addition, it assesses improvement-path registered by each country over time.

It satisfies desired properties like unit-free monotonic continuous function, time-reversal test, formation of chain indices, identification of the critical dimensions/indicators requiring attention and can be applied irrespective of distributions of the indicators. Besides, the measure helps in estimation of population GM , confidence interval of GM and statistical testing of $H_0: CI_{ti} = CI_{tj}$ for two countries i and j where $i \neq j$ at time period t or $H_0: CI_{ti} = CI_{(t-1)i}$ for the i -th country.

The proposed measure satisfying the above said desired properties and avoiding the criticisms of linear aggregation is an improvement over the existing methods. However, still there is room for improvement. Simulation study using multi data set is suggested to investigate finer points including robustness of the proposed CI and other recent methods and techniques.

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Economic valuation of hydroelectric dams' safety: Evidence from France

Avaliação económica da segurança das barragens hidroelétricas: Evidências de França

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Abstract: This paper aims to develop an economic approach that enables electricity generation companies to analyze and quantify the economic gains of complicated activities particularly the safety of hydroelectric dams. The method is based on calculating the costs avoided due to the implementation of safety mechanism. The specification of this method is founded on a solid literature regarding the economic assessment of the monetary value of complicated services. The results of this paper highlight the importance and the significant influence of safety activities in reducing costs, reaching approximately 26 million Euros. The results also shed light on the importance of the safety device to fight fatal accidents and ensure public security.

Keywords: Dams, Hydraulic safety, Financial valuation, Cost avoided method.

Resumo: Este artigo visa desenvolver uma abordagem económica que permita às empresas de produção de eletricidade analisar e quantificar os ganhos económicos de atividades complicadas, particularmente a segurança de barragens hidroelétricas. O método baseia-se no cálculo dos custos evitados com a implementação de mecanismo de segurança. A especificação deste método baseia-se numa sólida literatura relativa à avaliação económica do valor monetário de serviços complicados. Os resultados deste artigo destacam a importância e a influência significativa das atividades de segurança na redução de custos, atingindo cerca de 26 milhões de euros. Os resultados também esclarecem a importância do dispositivo de segurança para combater acidentes fatais e garantir a segurança pública.

Palavras-chave: Barragens, Segurança hidráulica, Avaliação financeira, Método de custos evitados.

1. Introduction

Hydroelectric dams are "living structures", functioning permanently to generate electricity and are often exposed to natural phenomena (flood, temperature, climate change etc.), thus, they require special care and enhanced monitoring.

Indeed, unlike nuclear power plants, hydroelectric dams include only a single and unique "physical" line of defense, which explains the need for predicting risks through implementing solid risk prevention tools, particularly daily auscultation.

The safety, the security and all environmental aspects of different power plants, are of particular interest for power energy producers. Because, the major challenge is to ensure optimal power production along with controlling for the dysfunctions and accidents that might threaten the safety system, especially when the dam exceeds twenty meters in height (in France about 200 dams exceed 20 m of height and 450 exceed 10m).

In fact, dam safety management has evolved gradually to meet the need of reducing fatal accidents and incidents causing economic losses, social and ecosystem damages. To manage these risks, the operator implements a safety device gathering a set of adapted measures to eradicate the risk or mitigate its severity and dangerous impacts.

Based on some observed disasters, several studies have been carried out in order to analyze and estimate social economic and environmental losses. However, it seems to be very difficult task to associate a market value to services provided by certain variables such as safety, security and environment. The key point of this paper is to fill this gap in the literature by applying an economic approach which provides the hydroelectric power generators with important tools to figure out how much does it cost a total or partial failure of a dam. Thus how much money they avoid to spend (implicitly money they win) while undertaking safety activities.

1.1. Dam safety regulations

Hydroelectric plant's operators are obliged to respect legal and regulatory requirements. This obligation becomes severe toward very dangerous dam

categories. In 2015, the French law has typically classified dams according to their height (H) and the volume of water stored (V).

Class A: $H \geq 20\text{m}$ and $H^2 \cdot \sqrt{V} \geq 1500$

Class B : $H \geq 10\text{m}$ and $H^2 \cdot \sqrt{V} \geq 200$

Class C : $H \geq 5\text{m}$ and $H^2 \cdot \sqrt{V} \geq 20$

The regulation enforces the owners and operators to ensure the safety and security of hydraulic dams to minimize the risks threatening the continuity of ecosystems, by implementing both punctual and continuous monitoring measures.

In fact, every dam has to be equipped with an auscultation device in order to ensure effective monitoring. The results of this device are reported to the regulator in form of monitoring and auscultation reports in a time interval, which differ according to dam category:

Table 1 Duration of reports and studies by dam's type

Dam's type	A	B	C
Monitoring report and technical visit	Once a year	Once every 3 year	Once every 5 year
Auscultation report	Once every 2 years	Once every 5 year	Once every 5 year
Hazard studies (Full Technical Exam)	Once every 10 years	Once every 15 year	-

In this paper, we apply the avoided cost approach to analyze and estimate the economic value of safety activities.

The remainder of this paper is structured as follows. Section 2 presents the methodology. The results are given in Section 3. Section 4 contains concluding remarks and suggestions for future research in this field.

2. Methodology

It is very complicated to give a market value to certain variables such as safety, security and environment. However, there are some non-market valuation methods, particularly regarding the assessment of environment and ecosystem value. These

approaches are divided into two categories: the Revealed Preference Theories such as the hedonic pricing, travel cost method, replacement cost and the avoided damage cost method, and the Declared Preference Theories like the contingent valuation method.

On one hand, the Revealed Preference¹ Theories deduce environmental services value from existed situations and decisions taken by individuals. They consist of examining environmental user's behavior and then deduce their preference or the value they attribute to environment.

On the other hand, the Declared Preference² Theories are techniques of estimating the demand function based on individual responses to hypothetical scenarios (survey techniques). These methods lead to adopt ex-ante perspectives and aim at maximizing the utility function. They provide a monetary valuation of demand parameters and can be combined to other methods for demand forecasting.

The two theories presented above have provided an added value in determining social cost while no market price is available, and are particularly applied in environmental issues.

To overcome the difficulty of calculating the gain behind safety activities, a cost avoided approach was applied in this study.

By definition, an avoided cost is an additional expense that operator avoids to support by taking adequate measures. This approach, which will henceforth be called the Cost Avoided Method (CAM), assesses gains related to safety and security activities by counting the costs involved in case of their misapplication or absence. Concretely, this requires answering the following question: what would be the economic costs incurred by the company (the operator) if safety and security activities were not applied?

On the basis of this purely accounting approach, we can assess both the cost of damage avoided through safety and security mechanism, and calculate the replacement cost of a damaged component.

¹Richter, M. K. (1966)

²Sen, A. K. (1971).

In fact, the CAM must reflect as accurately as possible the cost avoided by the company through safety and security activities. Moreover, it should, as far as possible, respect certain criteria to be solid, not denied or questioned:

- Objectivity assumptions: the calculation must be based on reliable, verifiable and non-manipulable assumptions;
- Simplicity: the calculation must be justifiable and easily explained to both professionals and the public;
- Continuity: in our analysis, the method adopted must be repeated during several years.

It worth reminding that, although our analysis is inspired by environmental approaches as mentioned above, the assessment contains total gain behind safety and security activities including economic, social, human and environmental gains.

2.1. Potential impacts:

The absence of safety activities could generate several dangerous consequences leading to different possible scenarios.

We assume that the monitoring activities of hydraulic dams, diagnosis and analysis of measures, or safety studies, are not correctly carried out or totally unrealized. Thus, some consequences to consider:

- Regulatory impacts: fine and penalties;
- Impacts to the operator: water level drop, total operating loss;
- Social and environmental impacts: damage to goods and ecosystems;
- Physical impacts on the dam: the dam can be damaged;
- Human impacts: life loss risk.

2.2. Assumptions

Before estimating probable scenarios, we would prefer to make some plausible assumptions that will be of major importance for our analysis, particularly for the very serious scenarios.

- The total average production of the hydropower energy of the concerned company is 50 TWh;
- The number of hydropower plants operated by the concerned company: 400;

- The average annual electricity production per power plant: 125000 MWh (author's calculation based on real data (total hydro power production in France /total power plants in France);
- The average number of victims affected by a dam failure: 200 individuals (calculation based on previous accidents);
- The percentage of loss of life among victims: 10% (Minimal percentage);
- The statistical life value in France is estimated at 2,4 Million €/life (according to OECD).

2.3. Possible scenarios

When the safety activities are poorly carried out or not realized, three main scenarios are conceivable, starting with the least serious to the most dangerous scenario:

Scenario I: the government imposes a fine on the hydroelectric power operator;

Scenario II: the government imposes special review procedures involving a loss of production;

Scenario III: dam failure implicating whether human loss risk, total operating loss, damage to the dam or damage to goods and ecosystems.

3. Results

3.1. Scenario I: Fine and penalties

In the first scenario, we assume that the operating company does not respect the regulation. Taking as example not transmitting the monitoring / auscultation reports within the deadlines already defined by the regulator (see details above in § Dam Safety Regulation).

According to the French hydraulic energy law of 16.10.1919, the lack of respect for the regulation exposes the operator to a fine of 75 000,00 €.

3.2. Scenario II: Special review procedures

In the second scenario, we also assume that the operating company does not respect the regulation, but the regulator considers it as very dangerous to pursue the operation of the dam in the present circumstances. Consequently, the regulator

forces the operator to adopt Special Review Procedures which puts the operator under operating constraints. Thus, this would take two major forms:

- Water level drop;
- Complete drainage of the dam.

The present scenario might cause either a total or a partial production loss. In this case, we assume four sub-scenarios per level of production loss calculated based on Eq.1 below:

$$AC = P \times L \times Ep * \quad (1)$$

**Based on Epex Spot Electricity Exchange data.*

Where **AC** refers to the avoided costs, **P** is the annual total production, **L** is the percentage of total potential loss and **Ep** is the average electricity prices per MWh.

Potential loss of 25% of annual production:

Avoided cost for potential production loss incurred by the hydropower plant estimated at 25%:

$$125000 \times 0.25 \times 33.544 = 1048250 \quad (2)$$

Potential loss of 50% of annual production:

Avoided cost for potential production loss incurred by the hydropower plant estimated at 50%:

$$125000 \times 0.5 \times 33.544 = 2096500 \quad (3)$$

Potential loss of 75% of annual production:

Avoided cost for potential production loss incurred by the hydropower plant estimated at 75%:

$$125000 \times 0.75 \times 33.544 = 3144750 \quad (4)$$

Complete drainage causing total production loss:

Avoided cost for potential production loss incurred by the hydropower plant estimated at 100%:

$$125000 \times 33.544 = 4193000 \quad (5)$$

Total weighted average loss of Scenario II:

Table 2 Probability distribution of each level of production loss

Level of production loss	Probability
25%	0,7
50%	0,1
75%	0,1
100%	0,1

$$[1048250 \times 0.7] + [2096500 \times 0.1] + [3144750 \times 0.1] + [4193000 \times 0.1] = 1677200 \text{ €} \quad (6)$$

Although the decision of lowering water levels depends totally on the regulator and considered as exogenous factor to the operator, the probability realization of the first sub-scenario (potential loss of 25%) is very high compared to the other three sub-scenarios. The intuition behind the use of this probability distribution can be explained by the fact that the operator takes all safety measurements and prepares technical documents needed to avoid strong abatement of water level that might cost the operator more than 25% of production loss.

3.3. Scenario III : Dam failure

This third scenario consists of a dam failure. This is the most serious scenario whose possible causes can be listed as follows:

- The absence or weak monitoring system and auscultation measurements not able to prevent dam failures;
- Poor flood forecasting or paralyzed warning systems;
- Defective mechanical system of the hydroelectric dam;

The above-mentioned factors would generate brutal flowing of water downstream and the realization of this scenario would have serious human, social and environmental impacts along with consequences on the operator and the hydroelectric power plant. Explicitly, this would result in total loss of production or a complete concession loss, potential loss of human life, serious damage to the dam and its entire environment including housing, land, farming nearby, etc.

These consequences can be gathered according to their scope perimeter, namely internal and external consequences.

3.4. Internal impacts:

The internal impacts are closely related to the dam component and the operator. They concern potential loss of operation and damage to the dam, which can be calculated as follows:

$$\text{Total loss of production: } 125000 \times 33.544 + 4193000 \quad (7)$$

Damage to the dam (dam failure): Estimated at 200 000 000 € as average investment cost for dam construction (because of the difficulty to get such information, the construction cost of Rizzanes dam is given as a reference, estimated at 200 000 000).

External impacts:

This concerns impacts that affect the external environment of the hydraulic dam (human, social and environmental impacts).

$$\text{Human life loss estimated at: } 2450000 \times 20 = 49000000 \text{ €} \quad (8)$$

Where 2,45 M is the life statistical value in France according to the Organization for Economic Co-operation and Development and 20 is the number of people exposed to the risk of loss of life weighted by the probability of risk occurrence estimated at 10% ($200 \times 0,1$).

Damage to property and to the environment which is very variable as the cost would vary between millions (321 809 489€: accident cost of **Grand Dixence** dam in Swiss) and billions of Euros (5,6 billion € : the cost of two dam failure of **Bento Rodrigues** in Brazil).

By adding the various internal and external costs of scenario III, we get the total cost as follows:

$$[4193000 + 200000000] + [49000000] = 253193000 \text{ €} \quad (9)$$

* Without counting the cost of compensation for social and environmental damage that might be imposed by the regulator.

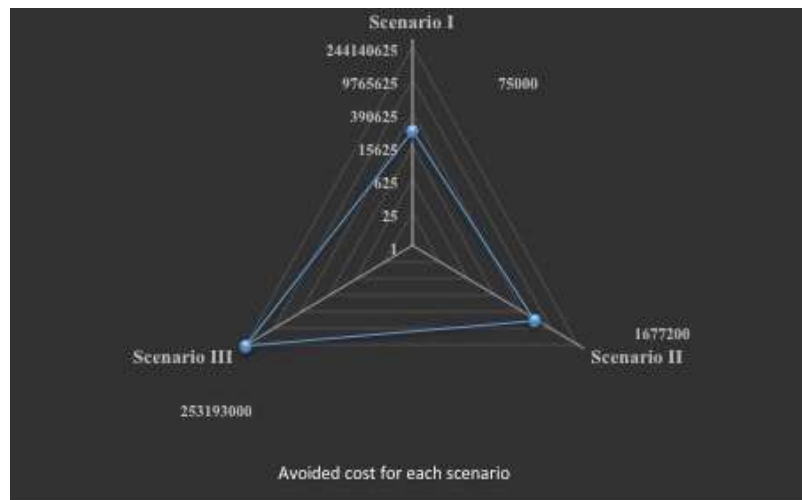


Figure 1 Added cost for each scenario

3.5. Weighted total of the three scenarios

Probability distribution:

Table 3 Probability distribution of each scenario

Scenario	Probability realization
Fine and penalties	0,6
Special review procedures	0,3
Dam failure	0,1

Wighted average:

$$[75000 \times 0,6] + [1677200 \times 0,3] + [253193000 \times 0,1] = 25867460\text{€} \quad (9)$$

4. Conclusion

Based on this analysis, it is obvious that safety activities avoid huge economic losses. The different scenarios mentioned in this analysis, formulated by increasing level of gravity, are the main proof. On average, these activities enable the operator to avoid costs of up to 26 Million EUR along with the cost of repairing social and environmental damages.

In fact, this analysis is considered as a first working element for the economic valuation of capital gains from activities difficult to quantify. Thus, the results can be developed. Future research in this field would be able to complete the study by

reinforcing its weak elements. To this end, several improvement tracks are conceivable. First of all, given its importance, it is very necessary to take into consideration the company's image in the calculation. In addition, it would be very interesting to integrate the notion of dam's classification and conduct analyzes for each category (A, B, C). This would provide more detailed and in-depth view of the gains behind safety activities. Furthermore, it would be beneficial to carry out a survey with data collected tools such as survey and interviews in order to get essential and precise inputs for the analysis. For example, it is very important to get data about the exact number of people located below the dam, the willingness to pay for reducing the risk of life loss of the population placed near the hydraulic power station, the willingness to pay to preserve the environment and the costs incurred by the population in case of a dam failure. The survey will reduce the use of standard values and thus refine the results of the analysis.

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Morocco's Entrepreneurial Landscape and Social Impact Funding Ecosystem During the COVID-19 Pandemic

O panorama empresarial de Marrocos e o ecossistema de financiamento do impacto social durante a pandemia de COVID-19

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Abstract: Many entrepreneurial and other collective initiatives create social impact in addition to economic gains. In this paper, we will discuss these initiatives with a focus on the financing ecosystem that is crucial to these organizations. We first discuss the social and solidarity economy before talking about entrepreneurship and social enterprises. We focus next on cooperatives, which are very important in our context for the impact they contribute to achieve.

The topic of the social and solidarity economy (SSE) in Morocco garners extensive attention within economic, political, and academic circles. Given the unique Moroccan backdrop, regional advancements, demographic dynamics, and economic traits, it accentuates considerable social issues and amplifies the significance of SSE entities, especially concerning their target audience. The SSE landscape, comprising a diverse array of organizations, has continually adapted and expanded since the country gained independence to address the distinct features of its environment.

This article is the result of an extended presence in our research field. We collected qualitative data after several interviews that we compared with official data presented in the paper. In this article we made an inventory of the key characteristics of the SSE sector before discussing the measures taken in the aftermath of the covid-19 pandemic. We finally highlight the need to finance cooperatives and to encourage the digitalization of their business models.

Keywords: Social, Financing, Ecosystem, cooperatives, Impact

Resumo: Muitas iniciativas empresariais e outras iniciativas coletivas criam impacto social para além dos ganhos económicos. Neste documento, discutiremos essas iniciativas com foco no ecossistema de financiamento que é crucial para essas organizações. Começamos por discutir a economia social e solidária antes de falarmos do empreendedorismo e das empresas sociais. De seguida, focamos as

cooperativas, que são muito importantes no nosso contexto pelo impacto que contribuem para alcançar.

O tema da economia social e solidária (ESS) em Marrocos é objeto de grande atenção nos meios económicos, políticos e académicos. Dada a singularidade do contexto marroquino, os avanços regionais, a dinâmica demográfica e as características económicas, acentuam-se as questões sociais consideráveis e amplifica-se a importância das entidades da ESS, especialmente no que diz respeito ao seu público-alvo. O panorama da ESS, que inclui um conjunto diversificado de organizações, tem vindo a adaptar-se e a expandir-se continuamente desde a independência do país para responder às características distintas do seu ambiente. Este artigo é o resultado de uma presença prolongada no nosso campo de investigação. Recolhemos dados qualitativos após várias entrevistas que comparámos com os dados oficiais apresentados no documento. Neste artigo, fizemos um inventário das principais características do sector da ESS antes de discutirmos as medidas tomadas na sequência da pandemia de covid-19. Por fim, destacamos a necessidade de financiar as cooperativas e de incentivar a digitalização dos seus modelos de negócio.

Palavras-chave: Social, Financiamento, Ecossistema, Cooperativas, Impacto.

Introduction

Many entrepreneurial and other collective initiatives create social impact in addition to economic gains. In this paper, we will discuss these initiatives with a focus on the financing ecosystem that is crucial to these initiatives. We will first discuss the social and solidarity economy before talking about entrepreneurship and social enterprises. We will focus next on cooperatives, which are very important in our context for the impact they contribute to achieving.

The social and solidarity economy (SSE) in Morocco is currently a central topic of extensive discourse within economic, political, and academic circles. The particular Moroccan backdrop, in conjunction with ongoing developments in the region, is compounded by its demographic and economic attributes, resulting in substantial social challenges. These challenges, in turn, underscore the indispensable role of SSE organizations, especially concerning the communities they cater to. The SSE landscape, consisting of a plethora of organizations, has persistently adapted and expanded since the country gained independence to address the distinctive aspects of its context.

The involvement of the state in Morocco's social and solidarity economy is of paramount significance, both in terms of the numerous public agencies dedicated to related matters and the financial resources allocated for this sector. Public authorities are keenly aware of the critical function these organizations perform in facilitating the integration of young individuals, empowering women, especially in rural areas, and enhancing access to education, among other pivotal aspects. Notably, the SSE sector has experienced substantial growth, largely attributed to the introduction of the National Initiative for Human Development (INDH) in 2005.

The INDH, considered one of Morocco's most substantial social initiatives to date, has placed particular emphasis on nurturing the associative and cooperative sectors, acknowledging their ability to meet the needs of the specific segments of the population targeted by the initiative. Consequently, since the inception of the INDH in 2005, there has been a conspicuous proliferation of associations and cooperatives. However, this expansion has created heightened demand for available sources of financing.

The issue of financing mechanisms in the ecosystems of the social and solidarity economy in Morocco is thus becoming increasingly relevant. In fact, despite the interest in this sector shown by public authorities, the available means of financing are few and must be diversified further in order to become accessible for a greater part of the population. Since the beginning of the pandemic in Morocco, the state has taken several measures to finance its small businesses that were hit hard. In this paper we make an inventory of the sector before discussing the measures taken in the aftermath of covid. We highlight the need to finance cooperatives and to encourage the digitalization of their business models.

1. Funding the Social Sectors: A Challenging Endeavor

1.1. Social enterprises and the struggle of financing

Social enterprises primarily rely on earned income, derived directly from trading profits or contracts awarded by government and other entities. However, accessing credit poses a significant challenge for these enterprises, as highlighted by Social Enterprise UK in 2011. While social enterprises primarily depend on internal resources like grants and philanthropic funding, the shortfall in external

funding significantly affects their growth and expansion. Scholars have stressed that social enterprises often grapple with resource constraints and capitalization issues. To address these challenges, social enterprises can adopt two distinct approaches.

One approach is the "bricolage" strategy, wherein social enterprises leverage their governance structures and stakeholder networks to access and create resources. They use persuasive strategies to establish legitimacy and achieve financial sustainability, as described by Sunley and Pinch in 2012. In this context, bricolage signifies resourcefulness, a refusal to be constrained by limitations, and a reliance on improvisation, as articulated by Baker and Nelson in 2005. According to this approach, social enterprises do not seek conventional business credit because they can reconfigure existing resources, as highlighted by Sunley and Pinch in 2012.

Conversely, "bootstrapping" behavior in social enterprises involves minimizing the need for external financing by reducing operational costs, improving cash flow, or utilizing internal financial sources within the organization, as elucidated by Ebben and Johnson in 2006.

Challenges related to information asymmetries, high transaction costs associated with small loans, and poor credit ratings affect both social enterprises and small businesses when it comes to accessing financial resources, as noted by Neeley and Van Auken in 2009, Ebben and Johnson in 2006, and Cassar in 2004. Additionally, like small businesses, the initial startup phase is critical for social enterprises due to the unconventional nature of their activities, as highlighted by Mavra in 2011.

The difficulty in attracting external financing is compounded by a lack of understanding of social enterprises, limited knowledge about their products, and the challenge of measuring their performance. Moreover, both social enterprises and small businesses often require small-sized loans, which can increase transaction costs for lenders. Furthermore, the hybrid business structure of social enterprises may give rise to legitimacy and legal issues. Despite their similarities to small businesses, social enterprises also differ in how they fund their operations. Being

double bottom-line organizations, they must carefully balance financial and social performance considerations in terms of financing.

To address these challenges and enhance the availability of finance for social enterprises, new initiatives have emerged, with social finance and impact investing gaining momentum. Social finance, defined as the practice of investing capital to generate a positive social and/or environmental impact while also yielding a financial return, encourages solutions that prioritize creating a positive impact, as articulated by the Task Force on Social Finance in 2010. It encompasses various socially oriented financial activities, such as impact investing or microfinance, harmonizing social and financial returns. Impact investing, as one of the initiatives within the framework of social finance, first appeared in 2007 and involves investments made with the intention of generating measurable social and environmental impact alongside a financial return, as defined by Martin in 2013.

2.2. Financing social Entrepreneurship

Understanding social entrepreneurship can be challenging due to its multifaceted nature, but it offers a range of perspectives for exploration (Mair and Marti, 2006). These perspectives converge in defining social entrepreneurship as an entrepreneurial approach aimed at creating social impact. The term "social impact creation" is defined by the Board of the social economy in its 2011 report as a collection of outcomes stemming from an organization's activities, affecting both its external and internal stakeholders, its geographic area, and society as a whole.

In essence, social entrepreneurship is viewed as an innovative endeavor focused on generating social value, which can occur within or at the intersection of nonprofit, commercial, public, and governmental sectors (Austin et al., 2006). Additionally, it is considered a process that involves all organizational processes employed to achieve this goal (Zahra et al., 2008). In simpler terms, social entrepreneurship encompasses any entrepreneurial initiative where the social or environmental purpose is equal to or greater than the economic objective (Sibieude, 2011).

In alignment with these perspectives, we support the idea of diversifying financing methods and creating hybrid entities that bridge profit and non-profit domains. Social enterprises inherently pursue both social and economic goals, often

referred to as the "double bottom line," with a focus on financial self-sufficiency to ensure their resilience, as articulated by Dorado and Haettich (2001). Within this context, social entrepreneurship includes nonprofit organizations that utilize business strategies to achieve financial independence while advancing their social missions (Lasprogata and Cotton, 2003). Thus, achieving financial autonomy becomes pivotal for generating and sustaining social impact. Given the distinctive nature of social enterprises, which may not attract as many stakeholders as for-profit businesses distributing dividends, it becomes evident that the availability of robust financial resources is crucial for creating social value.

3. Financing ecosystem in Morocco, Trends and barriers

3.1. Entrepreneurial finance in a Moroccan context

Morocco has implemented a series of reforms aimed at enhancing its entire financial system to increase its appeal for both domestic and international investments. Indeed, Morocco has introduced legislation and regulations that have allowed for a sustained increase in credit granted at all levels of the Moroccan economy. Among these measures, a credit bureau became operational at the end of October 2009 with the responsibility to develop credit information files through the processing, preservation, consolidation and analysis of indebtedness data of all credit institutions in Morocco. This system instituted the monitoring of key indicators to promote investment and improve the overall supply of finance.

Thus, in terms of financing the economy, the credits recorded a rise at the end of June 2018, driven by the growth in equipment credits (+9.9%), consumer credits (+5.6%) and real estate credits (+3.3%) according to the economic report (#258) published by the Department of Studies and Financial Forecast of the Moroccan Ministry of Finance.

Morocco is also home to the top-ranked financial center in Africa (Casablanca Finance City), ahead of Johannesburg (52nd globally), and the 3rd in the MENA region behind Dubai and Abu Dhabi, according to data from the Global Financial Centers Index (GFCI) Report, carried out in partnership by the UK's Z/Yen think-tank and China Development Institute (GFCI, 2018). After being ranked 35th globally in 2017, Casablanca Finance City is doing better in 2018, since the

financial center of the Moroccan economic capital has gained three places to settle in the 32nd position. Confidence in this financial market is further accentuated by the Supervisory Authority for Moroccan Stock Exchange Transactions, the Securities Ethics Council (CDVM), now having sufficient power to carry out its mission – evidenced by its ability to act with sanctions against certain listed companies, for example.

However, despite the rise in loans and the growing importance of this financial center, the reading of the main indices of the Casablanca Stock Exchange shows a downward trend in the Moroccan stock market whose indices continued, at the end of July 2018, their decline of 5.2% and 5.4% respectively compared to the end of December 2017. Morocco also has a primary and secondary bond market; however, they are low paying and much less dynamic than that of equities. Morocco has also established a legislative framework covering private equity and venture capital, funding mechanisms essential to the development of companies, as they finance the most critical stages of the company life-cycle: priming and development.

As a result, the country has more than 20 active funds, including two for SMEs under the Emergence Plan, a network of Business Angels created in 2008 (Medibtikar) etc. This approach is bolstered by the microfinance sector, which is organized through the National Federation of Microcredit Associations and the Mohammed VI Center for Solidarity Microfinance Support. Furthermore, the national guarantee system has undergone restructuring with the Central Guarantee Fund (CCG) development plan, transforming it into the sole actor in the national institutional guarantee framework where the Moroccan State holds a pivotal position since 2009.

Indeed, the national guarantee fund is "charged with a mission of general interest which consists, among other things, of sharing risks with financial sector players to facilitate access to financing" according to its institutional presentation. This intervention in favor of companies (5,200 very small businesses between 2009 and 2012 to 17,968 between 2013 and 2016) was carried out through the guarantee, the co-financing and the financing of the top of the balance sheet according to the last report of the CGC. The Moroccan banking sector markets leasing and factoring which benefit from a well-established regulatory

framework. In general, the OECD has raised a structural problem related to bank credit capacity in Morocco. This bank credits offer is more focused on large projects than on entrepreneurship (OECD, 2011). To this problem are added the guarantees required by the banks for the granting of credits, which remain very high (the pledge of real estate is generally required, thus the assets constitute the tangible guarantee to be backed by the bank credit file). This trend has been confirmed empirically by entrepreneurs who believe that these banks' requirements constitute one of the main obstacles to accessing financing, which mainly affects the majority of small structures in the Moroccan economy.

3.2. A Strategy to Encourage Entrepreneurship Based on Financing

Considering the significant role that investment, particularly Foreign Direct Investment (FDI), plays in the Moroccan economy, Morocco has adopted a strategy aimed at promoting entrepreneurship and expanding support for its growth. This strategy involves a diverse array of funding programs, tax incentives, and other measures. Morocco's commitment to this approach is evident through its accession to the OECD Declaration on International Investment in November 2009. This decision was made at the MENA-OECD Ministerial Conference in Marrakech, where Morocco signed the OECD Declaration on International Investment and Multinational Enterprises, aligning itself with the other 41 signatory countries. Among the programs that aim to promote entrepreneurship, we can mention the 2020 strategy of 'Maroc PME', which aims to stimulate investment and innovation, the industrial development fund and investment with direct aid granted to industrial ecosystems, etc. Moroccan Banks and the state are also collaborating to provide financing through young promoters' credits.

This type of loan is designed for individuals in Morocco aged between 20 and 45, provided they possess educational qualifications (higher education, vocational training, or a vocational certificate). This funding can encompass up to 90% of projects, with a fixed cap that cannot exceed approximately €92,000. The financing is split equally between the government and the commercial bank, each contributing 45%. Similarly, there exists a support program known as "Moukawalati" for the establishment of small businesses. This government initiative is aimed at graduates

of vocational training, higher education, and even individuals without formal degrees who have entrepreneurial ideas. This program provides assistance in three phases, in addition to simplifying access to credit.

The first phase is to help develop the business plan for the creation of the project. During the second phase of negotiations with the bank, Moukawalati provides assistance with the rectification of the business plan in addition to the follow-up of the formalities. Finally, after the start-up, Moukawalati provides an accompaniment of 12 months that includes a strength/weaknesses diagnosis of the companies created. In its financing component, Moukawalati offers two funding options. An interest-free advance representing a maximum of 10% of the investment, limited to 15 000.00dhs (1 380.56 €) repayable over 6 years, including three of grace, as well as a credit guarantee from the state of up to 85% that can be delegated to banks, thus drastically reducing the processing times.

Participatory loans are also part of the financing available for Moroccan organizations. The Bank Al Amal equity loan, for example, targets Moroccans who have resided or are still residing abroad and who wish to set up or develop businesses in Morocco. In this context, Bank al Amal jointly finances with another bank the creation/development of the company excluding for those operating in the housing and trading sectors. This funding is capped at 40% of the investment for a period of 2 to 15 years. Since 2017, Morocco has witnessed the introduction of fresh avenues for financing through Islamic finance, often regarded as an alternative approach. This Islamic finance concept pertains to economic, financial, and commercial activities that adhere to the principles and guidelines outlined in the Qur'an, the teachings of the Prophet Muhammad (PBUH), and Islamic jurisprudence. This financial system strictly prohibits significant risk or uncertainty (such as short selling and reliance on unforeseen events), rejects speculation (known as Maysir), and is founded on the principles of profit and loss sharing among stakeholders, as well as asset backing.

As a result of the recent authorization of Islamic finance in Morocco, a new banking landscape has emerged within the kingdom. This landscape is primarily comprised of institutions such as Bank al Yousr, Bank Assafa, Umnia Bank, Dar

Al-Amame (a subsidiary of the Société Générale Group), Nejma (part of the BMCI BNP Paribas group), and Arreda (a member of the Crédit du Maroc group).

Since 2017, these Islamic participative banks have been offering new products for a segment of customers who are reluctant to engage in traditional banking practices that may be contrary to their beliefs.

The financing offer proposed by these participating banks in Morocco includes three main products:

- The "Moudaraba" (participative technique of Islamic finance where the financier entrusts his money to a manager in a contract that combines capital and know-how in order to generate profits that will be redistributed.
- The "Ijara" (financing contract that is similar to traditional leasing), this contract stipulates the purchase of a financier (most often Islamic banks) of a property that will be rented to the contractor. The terms of rental, transfer of ownership are determined in advance and accepted by the contracting parties.
- The "Murabaha" technique of Islamic financing based on an asset. It consists of financing a tangible good in accordance with the principles of Islamic finance. This financing, the payment terms of which are predetermined, stipulates the intervention of a financier who will acquire the property and then resell it to the contractor for a price increase. The financier is required to keep ownership of the property to prevent this transaction from becoming a loan at interest.

Morocco offers the opportunity to access "honor loans" without interest, subject to specific eligibility criteria. These loans are provided through the Entreprendre Maroc network, an organization formed by business leaders in 2004. The loans are interest-free and come with a repayment period of five years, along with guidance and mentorship from seasoned business leaders. These business leaders serve as "business angels" by personally committing themselves and providing their financial support, availability, skills and networks for the success of the supported company. In addition to these means of financing, some companies offer, as part of their Corporate Social Responsibility, support for business creation.

For example, the Maroc Telecom Association for the creation and promotion of employment helps young people between the ages of 20 and 39 start businesses through financial support and accompaniment. This initiative offers an interest-free loan of up to € 9 200 to an investment ceiling of € 27 000. Beyond what has been described, additional means of financing and support for business development exist in Morocco; the following table cites a non-exhaustive list of these funds.

Table 1 : Other means of financing and support in Morocco

Name	Organization	Description	Phase concerned
At-Tahfiz-Leasing	Dar ad Damane	For companies just starting up or with less than one year of activity; Operating in sectors other than deep-sea fishing, agriculture (farms) and the liberal professions	Creation
SEAF Morocco Capital Partners	SEAF Morocco Growth Fund	Acquisition of a direct or indirect stake in the capital of innovative companies in the creation and post-creation phase.	Priming
Créativité et codéveloppement	Maroc PME®	Support and financing of creativity and co-development projects (grant)	Investment / Development
Damane créa	CCG	Guarantee of medium and long-term investment credits and leases.	Creation
Finéa Cautions	FINEA	Guarantees provided to cover the pecuniary guarantees required by the principals to bid on a public contract.	Exploitation
Capital amorçage	Azur Innovation	Take direct or indirect stake in the capital of innovative companies in the creation and post-creation phase.	Priming / innovation
Fond de garantie touristique CCG	Fond de garantie touristique CCG	Guarantee of medium and long-term bank loans for the development of accommodation and/or tourist animation products.	Creation

These instruments of financing are limited to the for-profit economy, however their transposition (or even their application as they are) to the social and solidarity economy should be considered. Accompanying programs such as "Moukawalati" can easily be applied to the social and solidarity economy with some adaptation to our context. For example, a possible adaptation could reconsider the amounts granted in order to reach a greater number of organizations while promoting sustainability through accompanying actions carried out by qualified professionals.

The modes of financing proposed by Islamic finance should also target organizations of the social and solidarity economy. Indeed, this ethical finance converges with the objectives pursued by the social and solidarity economy in Morocco especially as it can act as an alternative to microcredit for people wishing to avoid loans by interest for religious convictions. To support this funding ecosystem, it is necessary for the guarantee funds to broaden their scope of intervention to include social and solidarity economy organizations. Warranty services are indeed few as we explain in what follows and do not benefit the majority of the organizations of the SSE in Morocco. This situation is at the core of most of the funding issues raised by SSE organizations. Indeed, guarantees constitute a major obstacle to access to bank financing and consequently to the development of social and solidarity economy organizations. A strategy grouping these different mechanisms with a desire to make them benefit the Moroccan social and solidarity economy would thus be undeniably beneficial to this sector.

3.3. Social impact financing ecosystem in Morocco

3.3.1. Social and solidarity economy and funding

There is a wide range of financing alternatives available, but small SSE organizations (including cooperatives and associations) continue to face significant challenges in accessing funding. These challenges stem from the stringent collateral requirements, rigorous selection criteria, and the fact that many financing options are only accessible to individuals with a specific level of equity, among other factors. Moreover, certain financing measures and resources are tailored to specific sectors, particularly those that require substantial capital and significant investments, such as the industrial sector. Thus, it remains clear that the majority of conventional means of financing are not compatible with the specific needs of the social and solidarity economy in our context, which present for the most part an apparent degree of risk and uncertainty given the dependence on external factors (climate, for example, for the activities of agricultural cooperatives that are numerous in the Moroccan the social and solidarity economy). Indeed, social and solidarity economy organizations in our country challenge many commonly accepted rules of the conventional economy while pursuing social impact. For

example, the profile of the holders of some small SSE organizations (cooperatives and other income-generating activities) does not always match with that of the educated, experienced entrepreneur with multiple means of financing at any stage of maturity of his organization. Many of the beneficiaries of these structures (especially in the case of agricultural cooperatives that are the majority in Morocco) have a relatively low level of education, lack of work experience and live in precarious situations. The cooperatives and other SSE organizations are vital to these populations and therefore contribute to a strong social impact

The cooperative sector in Morocco is thus perceived as precarious by the vast majority, which tends to give rise to financing problems. Several national actors in social and solidarity economy have highlighted the need to act to improve the image of the ESS in the kingdom where it is viewed as "the economy of the poor". Apart from the characteristics of cooperative members in Morocco, including their income-generating activities and their reach in terms of geography and growth, these factors consistently prevent them from accessing conventional forms of financing due to their vulnerability. Consequently, there is an increasing competition for limited financing options, primarily reliant on government subsidies and the microfinance sector. These collective findings underscore the challenges faced by this sector in the presence of various structural and financial obstacles, necessitating specialized financial mechanisms and holistic funding models to furnish them with the essential resources and backing required for the continued existence and longevity of their organizations. For other SSE structures, the demand for funding varies depending on the sources of income. In fact, when the revenues generated from civil society, members or international funds fail to meet all the needs, they must turn to the state. Regional councils (elected bodies) also manage to allocate budgets for these structures, although political affiliations interfere with the selection processes of beneficiaries.

3.3.2. Demand and Supply of finance to SSE actors

As per the 2015 report from the Economic, Social, and Environmental Council of Morocco, associations rely primarily on two sources for funding: the state budget and international funding. Additionally, they receive financial support from

membership fees, donations, and grants from the private sector. Despite the dynamic nature of the associative sector driven by the national initiative for human development, this report highlights several structural weaknesses. According to the same source, the associative sector encounters impediments that hinder its growth, such as challenges in securing funding, a lack of suitable facilities and equipment, and difficulties in mobilizing volunteers and skilled personnel. These issues are further compounded by the absence of up-to-date and dependable data for a comprehensive analysis of the sector's financial challenges and deficiencies on a day-to-day basis.

Therefore, we deliberately chose to analyze the cooperative sector for the relative abundance of data compared to other branches of the SSE. For this, we will analyze the figures concerning cooperatives for the year 2015 (latest official figures published in the statistical yearbook of cooperatives and their unions in Morocco published in 2017). This choice is explained by the fact that the statistical yearbook of cooperatives and their unions is the main statistical reference of cooperatives in Morocco. The previous directory was published in 2010, which shows a certain gap in terms of updating the data.

Thus, for the latest official data on cooperatives, we are faced with a small proportion of reporting cooperatives of 5,375. The data provided by the statistical directory of the development and cooperation office are as follows:

Table 2 : Data on cooperatives and their unions (last official data)

Indicator	Amount (in Moroccan Dirhams)
Immobilized asset	2 610 098 284
Turnover	9 559 249 323
Total purchases	6 983 713 724
Excess (a)	448 118 438
Deficit (b)	-107 321 032
Self-employment (c)	426 984
Paid employment	35 472
Payroll	534 268 628

(a) Only for 1958 cooperatives with surplus

(b) Only concerns 359 cooperatives with a deficit

(c) For existing cooperatives in 2015 with the exception of those related to housing and consumption

Source : Statistical Manual of Cooperatives and their Unions for 2015, p. 13

These indicators are derived from 2015 data for 5 375 “most dynamic cooperatives¹” for which economic data is updated in the national database of cooperatives. At this level, it is important to note that housing and consumption cooperatives are not included by this census. In addition, the total number of reporting cooperatives represents only 34% of the total number of those registered for the same year (15 623 with a capital of nearly 6 449 841 472 Dirham). The turnover recorded (about 9.5 billion Moroccan Dirham) increased by 23% compared to the data of the fiscal year 2010. This significant increase in turnover represents an average of 1 778 463.68 Dirham per cooperative. For purchases, the 5 375 declaring cooperatives accumulated 6 983 713 724 Dirham representing 1299 295.57 Dirham per cooperative. Fixed assets amounted to 2 610 098 248 dh, which represents an average of 485 600 dh per cooperative. The cooperative sector employs some 35 472 non-cooperative members (29 members per cooperative on average). As a result, the wage bill of the cooperative sector according to the figures of the Office for Development and Cooperation is of the order of 534 268 628 Dirham which represents an average of 99 380 Dirham per cooperative.

This comparison between the turnover, purchases in addition to the average fixed structure of 485 600 Dirham, coupled with the pressure of the payroll, suggests short-term liquidity needs not revealed in the statistics as well as for the ongoing funding of cooperatives. As a result, the analysis of surpluses reveals that only 36% of the 5 375 cooperatives were able to make profits (1958 cooperatives). It should be recalled that this figure corresponds to only 12.5% of all cooperatives although this proportion is not significant. This total surplus is 448 118 438 Dirham which corresponds to 485 509 Dirham per cooperative. For cooperatives in deficit situations as identified by the statistical yearbook, there are 359 for a total deficit of (- 107 321 032 Dirham), an average of (-298 944 Dirham) per cooperative.

Considering the financing challenges encountered by cooperatives and other entities within the social and solidarity economy, microfinance emerges as a viable alternative to conventional funding methods that typically exclude a large portion of these initiatives from their sphere of operation. Microfinance receives special

¹ Classification used by the ODCO for cooperatives that regularly update and report their data

attention from the public authorities in Morocco because of its role in financing the social and solidarity economy sector. Indeed, a public institution is dedicated to this field (Mohammed VI Centre for Support to Solidarity Microfinance) which, among other things, is responsible for publishing quarterly trends as well as a monthly dashboard of microfinance in Morocco. The cross-reading of the latest publications of the center shows a slight decline of the microcredit sector compared to the same period of the previous year in terms of active borrowers (964 144 in 2017 against 943 457 in 2018). For the year 2018 (figures cumulated at the end of September), 37% of the loans were subscribed by collective borrowers (solidarity loans). 62% of loans were taken by individual borrowers and the rest by legal persons (SMEs). There is perfect parity between men and women in access to microcredit; however, rural people represent only 34% of the clients of these organizations.

The decline in borrowers was accompanied by the increase in the portfolio at risk² less than 30 days late including healthy outstanding (+ 1.9%), 30 to 60 days late (+8.9%), 60 to 90 days late (+ 3.7%), 90 to 180 days late (+10.5%) and more than 180 days late (+23.5%). In addition, outstanding loans recorded by microcredit institutions have increased by 2.7% compared to the same period in 2017. However, the sector experienced a recovery in the third quarter of 2018 compared to the second quarter of the same year. In fact, according to data for the third quarter of 2018, the number of active beneficiaries of microcredit institutions stood at 94 4625 clients, which represents an increase of 0.27% compared to the second quarter of 2018. These clients accumulated an average outstanding of the order of 7 402 dh at the end of September 2018, an increase compared to the end of June of the same year (7 375 dh).

In general, microcredit has distributed in Morocco an outstanding amount of 6 992 billion dirhams at the end of September 2018, compared to 6 948 billion dirhams at the end of June 2018. This amount has therefore increased by 0.63% in this quarter, despite vacations and religious holidays (Aid al Adha, the largest religious holiday in Morocco, took place on August, 22nd 2018). To cater to the

² Value of the outstanding balance of all loans in arrears, the Loan Portfolio at Risk is generally expressed as a percentage rate of the total loan portfolio currently outstanding.

unique needs of its clients, the microfinance sector had a workforce of 7,680 employees by the conclusion of the third quarter in 2018. This marked a 2.6% rise in comparison to the prior quarter, which ended in June 2018. This employee count translates to 139 customers per agent, a slight reduction from the 143 recorded at the end of June in the same year. For the risk portfolio at more than 30 days, it increased significantly by 14% in one quarter. Indeed, the latter was established at 419 330 million dirhams at the end of September 2018 against 367 695 million dirhams at the end of June 2018. The rate of portfolios at risk therefore followed the same trend from 5.29% in the second quarter to 6% in the third quarter for an increase of 0.71 points.

Table 3 : Data on the microcredit sector in Morocco.

	Feb 2020	Feb 2019	Evolution rate Feb 2020/Feb 2019
Active borrowers	908 251	887 815	2,30 %
Men	467 577	453 074	3,20 %
Women	440 674	434 741	1,36 %
Active borrowers			
Individual	591 757	557 127	6 %
Solidarity	310 430	327 096	- 5.10 %
Very small company	6 064	3 592	68.82 %
Active borrowers			
Rural	294 880	299 552	- 1.56 %
Urban	613 371	588 263	4,27 %
Decomposition of the risk portfolio			
Total outstanding credit (Dirham)	7 534 530K	6 828 803K	10.3%
30-day risk portfolio rate	2.97%	2.79%	0.18 point

Source: Adapted from the monthly table of microfinance in Morocco (February 2020) C.M.S

It becomes evident that agricultural cooperatives, which constitute the majority within the realm of Morocco's social and solidarity economy and naturally operate in rural areas, suffer from inadequate funding. In fact, there is still a need for several efforts to enhance the accessibility of funding options for SSE organizations. Nevertheless, the portion of SSE entities financed through microcredit and the significance attributed to this type of funding in Morocco establish it as a pivotal financial tool in our nation. Microfinance, in fact, holds a significant position among the financing methods available for the social and solidarity economy and seamlessly integrates into all the financing mechanisms introduced by the

government, such as supplementing the funding of the National Initiative for Human Development (INDH), for instance. The data concerning the microcredit sector in Morocco presented in the previous table indicates that, despite a slight decrease, it remains a pertinent financing mechanism in support of the social and solidarity economy.

4. Conclusion and discussion : The Post-covid Outlook

On March 20, 2020, Morocco declared a state of health emergency, causing disruptions in the lives of many individuals, particularly those who were isolated and economically disadvantaged. Across all regions of the country, social and solidarity economy (SSE) enterprises engaged in commercial activities suddenly found themselves devoid of any means of sustenance.

The revenue that typically sustains these organizations and supports the livelihoods of their members and their families experienced an abrupt interruption. In response to this significant social crisis, various economic measures were put into action. A noteworthy initiative, executed under the guidance of King Mohammed VI, involved the establishment of a Solidarity Fund with a current endowment exceeding MAD 30 billion. This fund serves multiple purposes, including the provision of allowances to employed individuals affiliated with the National Social Security Fund (CNSS) and the most vulnerable families benefiting from the Basic Medical Assistance Scheme (RAMED).

During the period of lockdown, 34% of households found themselves without any source of income due to the suspension of their economic activities. This percentage slightly varies among different demographics, with rural residents experiencing a slightly higher rate of 35% compared to 33% among urban residents. Furthermore, it reaches 44% within impoverished households, 42% among those living in precarious housing conditions, 54% among artisans and skilled workers, 47% among traders, and 46% among agricultural laborers.

Consequently, numerous stakeholders in the social and solidarity economy have experienced substantial setbacks, although an exact quantification remains elusive due to the absence of dependable statistics. Approximately one in five households, totaling 19%, received governmental assistance to mitigate the impact

of job loss. Of this group, 13% benefited from the RAMED program, while 6% received aid through the formal employee assistance program (CNSS).

According to a telephone survey conducted by the High Commission for Planning involving 4,000 companies at the start of April, nearly 142,000 companies, accounting for 57% of all businesses, reported having either temporarily or permanently halted their operations. Out of this total, over 135,000 businesses had temporarily suspended their activities, while 6,300 had permanently ceased operations. The pandemic has disproportionately impacted the smallest businesses. Very Small Enterprises (VSEs) make up the majority at 72%, followed by Small and Medium-sized Enterprises (SMEs) at 26%, and Large Enterprises (LEs) at only 2%, all experiencing temporary or complete cessation of operations. It is regrettable that there is no institutional study specifically targeting the Social and Solidarity Economy (SSE), mainly due to the challenges posed by restricted mobility and the lack of available information and databases. Nevertheless, we can draw inferences from the data presented and its sectoral implications for SSE organizations.

In the agricultural sector, where cooperatives are prevalent, there was a notable loss of 258,000 jobs, representing a 7.9% decrease in the third quarter of 2020 compared to the same period in 2019. This decline was more pronounced in rural areas, accounting for 260,000 job losses, while urban areas saw a creation of 2,000 jobs.

The "industry, including handicrafts" sector experienced a loss of 61,000 jobs, with 44,000 in urban areas and 17,000 in rural areas, resulting in a 4.8% reduction in employment within this sector. In the "services" sector, a nationwide loss of 260,000 jobs occurred, with 196,000 in urban areas and 64,000 in rural areas, translating to a 5.2% decline in employment in this sector.

The decline in employment affected all employment categories, with wage employment decreasing by 157,000 (a 3% decrease), self-employment dropping by 264,000 (a 7% decrease), and unpaid employment declining by 160,000 (a 10.3% decrease).

Despite the economic support measures implemented for the population, millions of Moroccans in the informal sector remain without a source of income.

In this context, an informational report published jointly by the Office of the High Commissioner for Planning and the World Bank in 2017 revealed that around 59.2% of Moroccan workers were involved in informal employment. The International Labour Organization underscores the importance of integrating these informal workers into the formal economy to ensure their access to decent job opportunities. To facilitate this transition, regulatory measures have been introduced to promote the establishment of Social and Solidarity Economy (SSE) entities. Presently, SSE provides employment for 5% of the Moroccan population, a figure that is anticipated to grow, driven by the increasing trend of SSE establishments, as promoted by Law 12-112. However, the crisis triggered by the pandemic has temporarily slowed down this progression. It has, however, underscored the pivotal role played by SSE organizations in the economic recovery, particularly in rural areas.

Furthermore, the COVID-19 pandemic crisis underscores the necessity of reevaluating social business models and encouraging collaborations between entrepreneurs, public authorities, and research entities to enhance the resilience of organizations that were severely affected during this episode. We also recommend the establishment of a support fund dedicated to social and solidarity economy institutions and the launch of local representation-based incubators and support structures to provide targeted assistance, ensuring the sustainability of SSE organizations in Morocco. Additionally, considering the drop in activity caused by COVID-19, it is essential to contemplate the integration of cooperatives and associations into the "Damane Oxygène" program to mobilize financing sources that have dwindled. Lastly, there is a pressing need to reconsider social business models and digitalize processes. Indeed, the pandemic has underscored the importance of digitization to enhance the sustainability of organizations operating in the social sector. The crisis has also emphasized that funding should be utilized to maintain social impact through robust business models and diversified activities.

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Le financement collaboratif comme source de financement de l'entrepreneuriat au Maroc

Collaborative financing as a source of funding for entrepreneurship in Morocco

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Résumé : Les PME sont confrontées à plusieurs défis dont le plus important est le problème d'accès aux financements traditionnels. C'est dans ce contexte que le crowdfunding apparaît comme une alternative prometteuse de financement. Cependant, malgré le potentiel du crowdfunding, il existe encore des défis et des interrogations quant à sa mise en œuvre et à son efficacité au Maroc. Il est donc essentiel de mener une étude approfondie.

Pour répondre à notre problématique principale à savoir : Est-ce que le crowdfunding pourrait-il être un levier efficace de financement pour l'entrepreneuriat au Maroc ?

Nous avons utilisé la méthode descriptive qui se caractérise par la description du phénomène étudié dans toute sa clarté.

Mots clés : Crowdfunding, financement collaborative, entrepreneuriat

Abstract: Small and medium-sized businesses face several challenges, the most important of which is the problem of access to traditional financing. It is in this context that crowdfunding appears to be a promising financing alternative. However, despite the potential of crowdfunding, there are still challenges and questions regarding its implementation and effectiveness in Morocco. It is therefore essential to carry out a thorough study.

To answer our main problem: Could crowdfunding be an effective financing lever for entrepreneurship in Morocco?

We used the descriptive method which is characterized by the description of the phenomenon studied in all its clarity.

Keywords: Crowdfunding, collaborative financing, entrepreneurship

Introduction:

Les petites et moyennes entreprises (PME) représentent, au Maroc, plus de 95% du tissu économique marocain. Par ailleurs, elles sont confrontées à plusieurs défis dont le plus important est le problème d'accès aux financements traditionnels. C'est dans ce contexte que le financement collaboratif également appelé le crowdfunding, le financement par la foule, le financement participatif, le financement communautaire, le financement solidaire, etc. apparaît comme une alternative prometteuse de financement est par conséquent devenu ainsi, un moyen de plus en plus populaire pour financer l'entrepreneuriat.

Au Maroc, on parle de financement collaboratif, il commence à faire sujet d'actualité, après adoption de la loi n°15.18 portant sur le financement collaboratif qui a été publiée au Bulletin Officiel N° 6967 du 8 Mars 2021.

Cependant, malgré le potentiel du crowdfunding, il existe encore des défis et des interrogations quant à sa mise en œuvre et à son efficacité au Maroc. Notre problématique est donc la suivante : Peut-on considérer le crowdfunding comme source de financement de l'entrepreneuriat au Maroc ?

Pour répondre à cette question, on va suivre le cheminement suivant : dans un premier temps on va essayer de délimiter le concept d'entrepreneuriat au Maroc, son état des lieux, l'importance et la place des PME dans l'économie marocaine, ainsi que les défis auxquels sont confrontés les entrepreneurs marocains en termes d'accès au financement. Puis, dans un second temps, on va aborder le crowdfunding de manière générale, en commençant par présenter l'émergence, la définition et les fondements du crowdfunding, ensuite, nous mettrons en évidence le mécanisme de fonctionnement de cette nouvelle alternative de financement, ainsi que son état actuel à l'échelle mondiale et au Maroc. Et en dernier lieu, on approchera la relation entre le crowdfunding et l'entrepreneuriat au Maroc, en mettant en évidence les facteurs clés de succès du crowdfunding en faveur de l'entrepreneuriat au Maroc, ainsi que les principaux goulots d'étranglement à son développement. Pour terminer enfin, par l'appréciation des principaux avantages et inconvénients de cette nouvelle pratique de financement en faveur de l'entrepreneuriat.

I. Entrepreneuriat au Maroc : définition et état des lieux

Le Maroc a accéléré le rythme des réformes économiques et sociales ces dernières années, avec des progrès significatifs réalisés à différents niveaux. Dans cette dynamique économique et sociale, l'entrepreneuriat est considéré comme l'un des piliers du développement économique, social et humain.

Faciliter la création de nouvelles entreprises est devenu une préoccupation importante pour les institutions publiques. La création de nouvelles entreprises est devenue une alternative efficace pour lutter contre le chômage et la précarité. Selon le Haut Commissariat au Plan, 93% du tissu économique est constitué des TPME.

1. Définition, formes et importance de l'entrepreneuriat :

1.1. Définitions de l'entrepreneuriat :

Après avoir cité plusieurs définitions, nous pouvons dire que l'acceptation par l'entrepreneur des risques impliqués dans la création d'une nouvelle activité, et sa connaissance des opportunités disponibles sur le marché, est le principal moteur derrière la création de l'entreprise.

1.2. Le principal acteur de l'entrepreneuriat : L'entrepreneur :

Nous pouvons dire que l'entrepreneur est une personne qui sait mobiliser des ressources financières dans un contexte d'incertitudes et de risques, et les moyens nécessaires pour réaliser un profit comme prévu. Tout en coordonnant les moyens nécessaires, en sachant organiser, prévoir, contrôler, commander et surtout mettre en action un processus innovant.

1.3. Les formes de l'entrepreneuriat :

Selon la littérature, le terme entrepreneuriat est très vaste et peut prendre diverses formes de création d'entreprise: L'entrepreneuriat ex-nihilo ; La reprise d'entreprise ; L'intrapreneuriat ; L'extrapreneuriat ou l'essaimage ; L'entrepreneuriat par franchise ; L'auto-entrepreneuriat ; L'entrepreneuriat social.

1.4. L'importance de l'entrepreneuriat :

Il joue un rôle très important dans : La création d'emplois ; La création d'entreprises et le renouvellement du parc ; L'innovation ; Mutations structurelles, politiques, économiques et sociales ; La création de la valeur ajoutée ; La distribution des revenus.

2. L'entrepreneuriat au Maroc : entre état des lieux et importance des PME :

2.1. État des lieux de l'entrepreneuriat au Maroc :

Selon les rapports de GEM (Global Entrepreneurship Monitor) l'entrepreneuriat au Maroc présente certains aspects à savoir :

- L'indice national du contexte entrepreneurial (INCE) du Global Entrepreneurship Monitor :

Le rapport mondial sur l'entrepreneuriat indique qu'en 2020, les évaluations d'experts au Maroc ont abouti à l'indice national du contexte entrepreneurial (INCE) du Global Entrepreneurship Monitor (GEM) de 3,8 le classant, ainsi, au 39^{ème} rang sur 44 économies. En 2021, ce score est passé à 3,9 mais l'augmentation du nombre d'économies et l'amélioration des environnements dans d'autres pays, ont placé le Maroc au 41^{ème} rang sur 50 économies. Puis, en 2022, des améliorations à tous les niveaux ont permis au Maroc de passer à un score de 4,3 le plaçant donc au 35^{ème} rang sur 51 économies.

- Les niveaux d'activité entrepreneuriale totale aux premiers stades :

Les niveaux d'activité entrepreneuriale totale aux premiers stades, sont passés de 12 % en 2019 à 9 % en 2020 et de 8 % en 2021 à 5 % en 2022.

Les résultats montrent que le niveau d'activité entrepreneuriale global aux premiers stades au Maroc a régulièrement diminué au fil des ans. En 2019, ce pourcentage était de 12 %, indiquant une présence relativement élevée d'entrepreneurs potentiels et d'entrepreneurs en démarrage. Par contre, en 2020, cette proportion est descendue à 9 % à 8 % en 2021. Les données pour 2022 montrent une chute significative de 5 %.

Les résultats montrent une tendance baissière du niveau d'activité entrepreneuriale au fil des années. En 2019, le taux était de 11,4%, indiquant un niveau relativement élevé d'engagement entrepreneurial dans le pays. Tandis qu'en 2020, cette proportion est descendue à 7,1% puis à 6,1% en 2021. Les données pour 2022 montrent encore une chute significative de 4 %.

2.2. Programmes de promotion de l'entrepreneuriat au Maroc :

Plusieurs programmes d'entrepreneuriat (Crédits jeunes promoteurs, Moukawalati, Innov Start) mis en place par le Maroc ont pour vocation d'encourager l'activité entrepreneuriale, créer des opportunités économiques et de favoriser

l'innovation. Or, on constate que les entrepreneurs se heurtent toujours à de nombreux obstacles. Les statistiques mentionnées plus haut, montrent un déclin significatif de l'activité entrepreneuriale ces dernières années. En 2019, le taux était de 11,4%, indiquant un niveau relativement élevé d'engagement entrepreneurial dans le pays. Alors qu'en 2020, cette proportion est passée à 7,1% puis à 6,1 % en 2021. Les données pour 2022montrent une chute aussi significative de 4 %.

2.3. L'importance des PME au Maroc:

Les PME marocaines représentent plus de 95 % du nombre total d'entreprises en activité et contribuent, selon les estimations, à plus de 20 % du PIB et à plus de 30 % des exportations créant, ainsi, une part importante des emplois informels.

D'après la fédération de la PME (affilié à la CGEM), la PME marocaine représente plus de 95% des entreprises, participe à 50% des salaires, contribue à 31% des exportations, 40% dans la production et 51%au sein des investissements marocains, enfin elle participe à 20% dans le PIB marocain, alors que cette parton la trouve dans certains pays de 60%.

3. Le financement comme le principal défi auquel font face les entrepreneurs marocains :

Le financement est considéré comme la pierre angulaire de la gestion financière d'une entreprise, et il joue un rôle crucial dans la promotion et le développement économique.

Il va sans dire que, la survie d'une entreprise dépend largement de sa capacité à gérer efficacement sesfinances, en particulier en ce qui concerne la façon dont elle gère ses ressources. D'autant plus que, le déficit de financement des petites et moyennes entreprises se manifeste au niveau des marchés bancaire et financier¹.

Grosso modo, La plupart des études s'accordent que les problèmes de financement figurent parmi les obstacles les plusimportants qui entravent la création et le développement des PME dans l'économie nationale.

¹ Selon l'HCP, les TPME sont les plus confrontées au problème de financement, 69% d'entre elles ont, en effet, souffert des difficultés d'accès au financement.

Il est donc nécessaire de diversifier les formes et les sources de financement PME, compte tenu de leur difficulté et leur limitation, ainsi que des garanties exigées par le financement classique, notamment par les banques et les institutions financières spécialisées. De nombreuses formes de financements innovants sont apparues, adaptées aux caractéristiques de ces établissements, parmi ces nouvelles formes de financement, on trouve le financement collaboratif (le crowdfunding) via des plateformes d'Internet. C'est un aspect qui va être abordé au cours du deuxième chapitre.

II. Le crowdfunding en général

Après avoir présenté les concepts d'entrepreneuriat et de PME et leurs importances, de telle sorte que la catégorie d'entreprise : PME est considérée comme l'épine dorsale des économies développées et des pays en développement, à la lumière de sa contribution significative à la production des revenus et à la création d'emploi. Par ailleurs, cette catégorie d'entreprise fait face à un certain nombre de défis qui empêchent sa croissance et son expansion, dont le plus important est la difficulté d'accéder au financement fourni par les institutions financières traditionnelles représentées par le secteur bancaire. Suite, essentiellement, aux risques élevés de prêt liés aux manques de garanties. D'où, la nécessité de développer de nouveaux mécanismes de financement appropriés pour ce type de projets. C'est dans ce contexte que le financement collaboratif a vu le jour comme nouvelle forme de financement.

1. Définition et fondements du crowdfunding :

Le principe du crowdfunding ou du financement collaboratif est de collecter des fonds auprès d'un grand nombre de contributeurs, généralement grâce aux grandes évolutions offertes par le développement des réseaux sociaux, l'internet et les sites web. Les entrepreneurs présentent leur projet sur la plateforme en ligne et les contributeurs peuvent choisir de soutenir financièrement le projet en faisant un don ou en investissant dans l'entreprise.

1.1. La définition du crowdfunding :

Il n'existe pas une définition commune pour ce concept. Cependant, nous pou-

vons dire que le crowdfunding est tout simplement un mode de financement, qui se fait souvent par le biais d'internet, où la personne souhaitant obtenir le financement nécessaire pour réaliser son projet, présente à un grand public son idée ou son projet via des plateformes spécialisées.

1.2. Les fondements du crowdfunding :

Les principaux fondements du crowdfunding sont la participation active ; la diversité des sources de financement ; la transparence ; l'effet de réseau ; la discipline ; la collaboration.

2. Le fonctionnement du Crowdfunding :

2.1. Les modèles du crowdfunding :

Ce type de financement peut être réparti en trois catégories, en fonction des objectifs que les plateformes de financement collaboratif cherchent à atteindre.

2.1.1. Le financement par le don : les contributeurs font un don sans attendre de contrepartie en retour. Cela peut être utilisé pour financer des projets à caractère social, culturel ou environnemental. Il existe deux types de financement collaboratif en don :

- Le don simple sans contrepartie (Donation-based) :
- Le don avec récompense (Reward-based).

2.1.2. Le financement par le prêt (le crowdlending) : les contributeurs prêtent de l'argent à l'entrepreneur, qui s'engage à le rembourser avec intérêts à une date ultérieure. On distingue deux types :

- Le prêt non rémunéré : Le contributeur récupère seulement ses fonds et ne perçoit pas d'intérêt.
- Le prêt rémunéré : Les contributeurs prêtent aux entreprises et aux porteurs de projet contre un remboursement monétaire sous la forme d'intérêts, selon les modalités convenues préalablement entre les parties prenantes.

2.1.3. Le financement en capital ou l'investissement (crowdequity) : les contributeurs investissent dans l'entreprise et deviennent ainsi actionnaires. Ils peuvent donc espérer obtenir un retour sur investissement si l'entreprise se développe avec succès. C'est donc, un Crowdfunding basé sur les actions. La foule a la possibilité d'investir dans une entreprise dans la plupart des cas une startup en échange d'actions de cette entreprise.

2.2. Les acteurs et le processus d'une opération du crowdfunding :

2.2.1. Les acteurs du crowdfunding :

Le financement collaboratif est basé sur une relation entre trois parties : les entrepreneurs qui sont porteurs de projets en manque d'argent, les investisseurs qui ont de l'argent à investir et les plateformes de financement collaboratif qui servent d'intermédiaires entre les porteurs de projets et les bailleurs de fonds.

2.2.2. Le processus d'une opération du crowdfunding :

Le processus de financement de projets via des plateformes de financement collaboratif passe par les étapes de base suivantes :

Etape 1 : Préparation du projet de financement ;

Etape 2 : Présélection des projets par les plateformes de crowdfunding ;

Etape 3 : Présentation des détails des projets éligibles via les plateformes de crowdfunding ;

Etape 4 : Financement du projet ;

Etape 5 : Réalisation du projet ;

Etape 6 : Remboursement du prêt et rendement des actions.

3. Etat des lieux, évolution et perspectives du Crowdfunding :

3.1. Au niveau mondial :

Le crowdfunding est considéré comme l'un des canaux de financement en croissance ces dernières années. Par exemple durant la période entre 2011 et 2015, le volume total du crowdfunding ne dépassait pas 1,5 milliard de dollars américains en 2011, alors que sa valeur en 2015 est d'environ 34,44 milliards.

La banque mondiale, ainsi que le site américain du crowdfunding (Findly – L'industrie du CF)² estiment que le crowdfunding pourrait atteindre 300 milliards de dollars de collecte en 2025 à l'échelle mondiale.

3.2. Au Maroc :

On va essayer de résumer le développement du crowdfunding à partir de ses débuts au Maroc, en l'occurrence 2014 :

2014 : Les débuts : Happy Smala lance la première plateforme de crowdfunding de type don avec contreparties pour les projets sociaux et culturels au Maroc.

² Massolution, Rapport 2015CF, The Crowdfunding Industry Rapport 2015CF.

2015 : Démarrage des travaux sur le projet de loi et lancement de la plateforme de don pour les associations « Cotizi.ma ».

2017 : Happy Smala et le Centre marocain pour l'innovation et l'entrepreneuriat social (MCISE), lancent la plateforme de prévente « Wolouj » pour les projets innovants et à fort impact dans la région MENA.

2018 : Premier pas vers l'établissement de la loi : Dépôt du projet de loi au secrétariat général du gouvernement par le ministère de l'économie et des finances. Cette année a connu également le lancement de « Ciwa », la plateforme de « Dar't » en ligne.

2019 : En septembre 2019, le projet de loi du crowdfunding est à l'ordre du jour du Conseil de gouvernement. L'inauguration de la plateforme de mise en relation avec les investisseurs, « Flowingo ».

2020 : En janvier 2020, la Chambre des représentants du Maroc vote à l'unanimité pour l'adoption de la loi du crowdfunding. Une nouvelle plateforme de don « DealKhir.ma » s'ajoute à l'écosystème, une nouvelle façon d'acheter en soutenant gratuitement des projets solidaires grâce à l'achat en ligne.

2021 : En mars 2021, la loi 15.18 pour le financement collaboratif est publiée au bulletin officiel. Les régulateurs démarrent ainsi les travaux sur les décrets d'application.

2022 : En juin 2022, les régulateurs partagent les premières versions des décrets d'application. Et à la fin du même mois, Happy Smala et ESSEC Afrique publient le baromètre du crowdfunding 2019-2021.

Selon ce baromètre du crowdfunding, sur la période 2019-2021, environ 3,7 millions de dirhams (MDH) ont été collectés par les projets marocains, 171 projets marocains financés sur 13 plateformes internationales. Par campagne, le montant maximum mobilisé a atteint 317.867 dirhams, tandis que le plus grand nombre de contributeurs par campagne s'est élevé à 1.198.

Le baromètre Marocain du crowdfunding renseigne également sur l'impact des projets financés. Dans ce cas, 40% du montant collecté a été utilisé pour financer des projets sociaux, 22% pour démarrer des activités économiques et 10% pour soutenir des projets éducatifs.

Le cadre réglementaire du crowdfunding au Maroc (loi n°15.18) :

La loi n° 15-18 fixe le cadre juridique des sociétés de financement collaboratif

(SFC)³. En effet, elle se compose de 70 articles, la loi établit un système réglementaire complet des activités de financement collaboratif, le dispositif comprend notamment :

- La mise en place du statut managérial de la plateforme de financement collaboratif (PFC), en l'occurrence la SFC ;
- La définition du dispositif d'agrément par l'administration des SFC et la supervision de ses activités, assurées par Bank Al Maghrib pour les activités de prêt et de don et l'Autorité Marocaine des Marchés de capitaux (AMMC) pour les activités d'investissement en capital ;
- Définir les procédures et modes de création et de fonctionnement des PFC ;
- La définition des engagements et obligations de la SFC, notamment en matière d'information du public, de publicité, de reporting, etc ;
- Définition des règles à suivre dans la pré-vérification du projet à financer, sécurisation des transferts et protection des donateurs ;
- Définir des plafonds pour chaque projet et le montant d'argent levé par chaque donateur pour les diverses formes de financement ;
- Définitions de règles spécifiques pour chacune des trois formes de financement collaboratif.

En fine, on peut dire que le crowdfunding constitue l'une des sources innovantes de financement pour les PME. Ce mécanisme alternatif gagne en popularité auprès des entrepreneurs marocains, mais son développement est freiné par de nombreux facteurs. Dès lors, la prochaine étape de notre travail consistera à s'intéresser aux avantages et limites du crowdfunding comme solution de financement de l'entrepreneuriat. Ainsi qu'à analyser les facteurs clés de succès du crowdfunding et les principaux freins à son développement au Maroc.

III. Le crowdfunding comme solution pour l'entrepreneuriat au Maroc

Le financement collaboratif a connu un essor de développement dans le monde ces dernières années. Cela peut être attribué à la révolution de la technologie et des moyens de communication.

³ LOI N°15-18 régissant les activités de financement collaboratif au Maroc; No 7014 – 10 moharrem 1443 (19-8-2021) B.O 1199.

Le processus de financement collaboratif comprend de nombreux acteurs, il comprend les investisseurs, les porteurs de projets qui recherchent des financements, ainsi que des plateformes de financement.

1. Les facteurs encourageant ou décourageant l'adoption du crowdfunding comme source de financement :

1.1. Les facteurs clés de succès du crowdfunding en faveur de l'entrepreneuriat au Maroc :

Il est prévu que le marché du financement collaboratif connaîtra une croissance importante dans les prochaines années au Maroc, sous certaines conditions, à savoir :

- Le développement de la technologie financière, technologies de l'information et de la communication.

- Une diaspora résidente à l'étranger (MRE) importante : sont souvent financièrement stables et disposent d'une capacité de contribution élevée.

- Facteurs sociales et culturels : La générosité et la culture des citoyens marocains ainsi leur attachement à la religion et ses principes qui prônent l'entraide.

- Le facteur du marché : le financement est devenu difficile, avec une demande de prêts plus faible. Cela a entraîné un élargissement du déficit de financement dans le secteur bancaire. Ce qui a incité les entrepreneurs à envisager d'autres alternatives de financement plus largement accessibles et à un coût moindre.

1.2. Les principaux obstacles au développement du crowdfunding au Maroc :

- La faible culture autour du crowdfunding : Il y a une certaine méconnaissance ainsi que de fausses idées sur le concept, les gens ne savent pas comment fonctionne le financement collaboratif et comment participer en tant que donateur (contributeurs) ou chef de projet (porteur de projet).

- Le faible taux de bancarisation : Alors que le taux de bancarisation au Maroc, a augmenté de manière remarquable ces dernières années (78% en 2020), l'alphabétisation limite l'utilisation des instruments de paiement scripturaux et limite aussi l'inclusion financière au Maroc.

- Le manque de confiance des parties prenantes : Les principales raisons de cette méfiance sont la sécurité des transactions et la multiplication des escroqueries en ligne.

- Plafond défini : Selon la loi 15-18, le montant collecté pour un projet de financement collaboratif ne peut dépasser les 5 millions de dirhams. De plus, les contributions cumulatives d'une personne individuelle pour un projet spécifique sont plafonnées à 250 000 dirhams.

2. Apports et limites du crowdfunding comme source de financement de l'entrepreneuriat :

2.1. Les avantages du crowdfunding pour les entrepreneurs :

- Le crowdfunding permet aux entrepreneurs d'accéder plus facilement et rapidement au financement, et surtout d'être moins dépendant des sources de financement classiques tels que les banques ou les investisseurs.

- La formation d'ambassadeurs du projet, parce qu'ils se sont personnellement investis, est un atout extrêmement précieux.

- La Validation du projet : le crowdfunding permet de tester l'intérêt et la demande pour un produit ou un service avant même son lancement. Si un projet ne parvient pas à trouver suffisamment de contributeurs, cela peut être un signe qu'il n'y a pas de marché pour celui-ci.

- C'est un outil de communication et marketing : la plateforme de crowdfunding permet de promouvoir le projet et de créer une communauté de supporters qui pourraient devenir des clients fidèles par la suite.

2.2. Les inconvénients du crowdfunding pour les entrepreneurs :

- Concurrence accrue : avec la popularité croissante du crowdfunding, de plus en plus de projets sont présentés aux contributeurs, ce qui rend la concurrence plus féroce.

- Risque de dépendance à la plateforme : si un entrepreneur réussit à financer son projet grâce au crowdfunding, il peut devenir dépendant de cette source de financement et avoir du mal à trouver d'autres sources de financement par la suite.

- Risque de ne pas atteindre l'objectif de financement : si un projet ne parvient pas à atteindre son objectif de financement, les contributeurs ne seront pas débités et l'entrepreneur ne recevra pas les fonds.

- Paiements de commission : Chaque plateforme fixe une commission, qui peut aller de 2% à 25% du montant collecté. Cela ne peut être ignoré, car enlever une moyenne de 10% des fonds reçus peut déstabiliser la mise en œuvre du projet.

Conclusion

Cette recherche nous permet de conclure qu'au-delà du financement d'entreprises et de projets, le financement collaboratif est un véritable outil de développement économique et social. En fait, cela permet aux entrepreneurs de faire connaître leurs projets et d'accroître leur crédibilité sur le marché. Le recours au crowdfunding permet un accès rapide au marché, ainsi que des tests ciblés de produits, ce qui permet d'économiser du temps et de l'argent. Le crowdfunding semble être une alternative très intéressante, vu que les jeunes entrepreneurs ont de plus en plus du mal à lever des fonds via les voies de financement classiques. Toutefois, il est indispensable d'étudier son attractivité, d'une part, maintenir les forces et renforcer les faiblesses, et d'autre part bénéficier de ses opportunités et se protéger de ses menaces.

Ainsi, nous pouvons dire que le crowdfunding pourrait constituer un levier efficace de financement pour l'entrepreneuriat au Maroc. Étant donné que le financement collaboratif est un mécanisme qui est relativement nouveau au Maroc, il est donc, essentiel de lui accorder de l'attention et de chercher à le développer. Ceci passe essentiellement par une sensibilisation accrue aux avantages du crowdfunding, qui est nécessaire pour encourager les investisseurs et les propriétaires de PME et des startups à utiliser cette méthode de financement. En effet, des campagnes de sensibilisation peuvent être menées par des acteurs clés tels que les associations d'entrepreneurs et les institutions financières.

De plus, il faut veiller à la mise en place d'une législation qui favorise le financement participatif. Cela peut se faire en définissant clairement les règles et les procédures réglementaires appropriées régissant les plateformes de financement collaboratif, en facilitant la création de plateformes de financement participatif et en offrant des incitations fiscales aux investisseurs, afin de protéger les droits des différents participants à ce processus.

Sans oublier, le développement d'une infrastructure en ligne solide⁴, à travers des connexions Internet fiables et rapides, ainsi que des systèmes de paiement en ligne sécurisés.

Ainsi que mettre l'accent sur l'innovation de telle sorte que les projets entre-

⁴ Élément crucial pour faciliter le fonctionnement des plateformes de crowdfunding.

preneuriaux innovants aient tendance à attirer l'attention des investisseurs potentiels. Ce qui aura pour conséquence l'encouragement des entrepreneurs à proposer des idées novatrices et donc stimuler le succès du crowdfunding au Maroc.

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L'action Apple, une opportunité de suivi de tendance : Zoom sur les ratios financiers et l'évolution boursière de 2019 à 2023

Apple shares, a trend-following opportunity:
Focus on financial ratios and stock market trends from 2019 to 2023

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Résumé : Cet article vise à évaluer la performance et la rentabilité de l'action Apple, ainsi que sa stratégie du suivi de tendance, à partir de différents ratios financiers, sur une période de cinq ans, de 2019 à 2023. Pour cela, il s'appuie sur le concept du suivi de tendance, une stratégie de tendance qui consiste à suivre la direction du marché, sans chercher à anticiper les changements. Après une présentation de la revue de la littérature sur le sujet, nous présenterons les indicateurs et outils pour suivre une tendance, ensuite nous analyserons les données financières d'Apple, et son comportement boursier, sur une période de cinq ans. Nous allons conclure notre article en donnant des recommandations sur l'opportunité d'investir ou non dans l'action Apple.

Mots clés : Suivi de Tendance, Apple, Ratios Financiers, Analyse Boursière.

Abstract: This article aims to evaluate the performance and profitability of Apple Stock, as well as its trend following strategy, based on different financial ratios, over a period of five years, from 2019 to 2023. For this, it relies on the concept of trend following, a trading strategy that consists of following the direction of the market, without trying to anticipate changes. After a presentation of the literature review on the subject, we will present Indicators and tools to monitor a trend, then we will analyze the financial data of Apple, and its stock market behavior, over a period of five years. We will conclude our article by giving recommendations on whether or not to invest in Apple stock.

Keywords: Trend Following, Apple, Financial Ratios, Stock Market Analysis.

Introduction :

Le trend following est une stratégie de trading qui consiste à suivre la direction du marché, sans chercher à anticiper les retournements ou les corrections. Il s'agit d'une approche simple, efficace et adaptée aux marchés volatils et incertains. Le trend follower achète quand la tendance est haussière et vend quand la tendance est baissière, en utilisant des indicateurs techniques et des règles de gestion du risque (Faber, Mebane T. 2010).

Dans ce rapport, nous allons appliquer le trend following à l'action Apple, l'une des plus grandes entreprises technologiques au monde, qui a connu une croissance exceptionnelle ces dernières années. Nous allons utiliser différents ratios financiers pour évaluer la performance et la rentabilité de l'entreprise, ainsi que sa capacité à suivre la tendance du marché boursier. Nous allons nous appuyer sur une méthode quantitative, fondée sur des données chiffrées et des calculs statistiques (Covel, Michael 2009). Notre objectif est de répondre à la question suivante : comment peut-on évaluer la performance et la rentabilité de l'entreprise Apple, ainsi que sa stratégie de suivi de tendance sur les marchés boursiers, à partir de différents ratios financiers sur la période de 2019 à 2023?

Pour y répondre, nous allons procéder en deux parties : Dans une première partie, nous allons présenter une revue de la littérature sur le trend following, ses origines, ses principes et son évolution dans le temps, et nous présenterons également quelques indicateurs et outils pour identifier et suivre les tendances des marchés financiers. Dans une deuxième partie, nous allons analyser les données financières de l'entreprise, en utilisant des ratios tels que le chiffre d'affaires, le bénéfice net, la marge nette, le ROE, le ROA, la capitalisation boursière, le flottant, etc. Nous allons comparer ces ratios aux moyennes du secteur et aux attentes du marché, et étudier leur évolution sur une période de cinq ans, de 2019 à 2023. Et finalement, nous allons analyser le comportement boursier de l'action Apple, en utilisant des indicateurs techniques tels que le prix, la SMA, les niveaux de résistance et de support, etc. Nous allons déterminer la tendance générale de l'action, ses fluctuations, ses points d'entrée et de sortie, et sa stratégie de trend following.

1- Revue de littérature :

Le suivi de tendance est une stratégie d'investissement active qui s'adapte bien à de nombreuses catégories d'actifs différentes, comme les actions, les obligations, les matières premières ou les devises. C'est une méthode de Trading simple qui a connu un grand succès dans les années 1970. De nombreux traders renommés profitaient des fortes tendances de cette époque. Le suivi de tendance est une stratégie de Trading simple qui peut s'appliquer à tous les marchés. Elle se base uniquement sur l'analyse technique et ne requiert pas d'analyse fondamentale.

Le suivi de tendance est une stratégie d'investissement ou de Trading qui cherche à profiter des mouvements à long, moyen ou court terme qui se produisent sur différents marchés. Les traders qui utilisent une stratégie de suivi de tendance ne cherchent pas à anticiper ou à prédire des niveaux de prix précis ; ils se contentent de suivre la tendance, quand ils constatent qu'une tendance s'est formée selon leurs propres critères ou règles spécifiques (Cook, Timothy E. and Korn, Ronald (2021).

Une tendance de marché est une tendance d'un prix d'un marché financier à évoluer dans une direction particulière au fil du temps. S'il y a un virage contraire à la tendance, ils sortent et attendent que le virage s'établisse comme une tendance dans la direction opposée. Dans le cas où leurs règles signalent une sortie, les traders sortent mais rentrent lorsque la tendance se rétablit (Covel, Michael 2009).

Quitter le marché lorsque le marché se retourne contre eux pour minimiser les pertes et laisser courir les bénéfices, lorsque la tendance du marché se déroule comme prévu jusqu'à ce que le marché s'épuise et s'inverse pour enregistrer des bénéfices. Cette méthode de négociation ou de « pari avec avantage positif » implique une composante de gestion des risques qui utilise trois éléments : le nombre d'actions ou de contrats à terme détenus, le prix actuel du marché et la volatilité actuelle du marché . Une règle de risque initiale détermine la taille de la position au moment de l'entrée (Kaufman, Perry J. 2013).

L'objectif principal du trend following est de capturer les gains potentiels lorsque les prix d'un actif augmentent, tout en minimisant les pertes lorsque les prix diminuent. Pour ce faire, les traders utilisent généralement des outils techniques tels que les moyennes mobiles, les indicateurs de momentum et les lignes de tendance pour identifier les tendances en cours. Une fois qu'une tendance a été identifiée, les

traders prennent des positions dans le sens de cette tendance, en achetant lorsqu'il s'agit d'une tendance haussière et en vendant à découvert lorsqu'il s'agit d'une tendance baissière (Caginalp, Gunduz and Balenovich, D. 2014).

1-1 l'évolution de la stratégie du Trend Following :

L'histoire et l'évolution de la stratégie du Trend Following remontent à plusieurs décennies et sont marquées par des développements significatifs. Voici un aperçu de son évolution historique (Lempérière, Y. et al. 2016) :

Années 1940-1950 : Les prémices

- La stratégie du Trend Following trouve ses racines dans les marchés des matières premières, où les premiers traders ont observé la formation de tendances de long terme.
- Ces traders ont commencé à utiliser des outils et des méthodes techniques pour identifier les tendances naissantes et chercher à en tirer profit.

Années 1960-1970 : Les pionniers

- Richard Donchian, souvent considéré comme le père du Trend Following, a développé des systèmes de Trading mécaniques basés sur des règles strictes. Ces systèmes ont permis de suivre les tendances sans émotion ni analyse subjective.
- Charles Dunn a contribué à la popularisation de cette approche, notamment dans les marchés à terme.
- La décennie des années 1970 a vu la montée en puissance de fonds de couverture spécialisés dans le Trend Following.

Années 1980-1990 : La reconnaissance institutionnelle

- Le Trend Following a gagné en reconnaissance institutionnelle pendant cette période, grâce aux performances exceptionnelles de traders et de fonds de couverture tels que John W. Henry.

- L'utilisation de l'informatique et de l'automatisation a permis de rendre les systèmes de Trend Following plus sophistiqués.
- La stratégie s'est étendue à d'autres classes d'actifs, notamment les marchés boursiers et les taux de change.

Années 2000-2010 : La diversification et la crise financière

- Le Trend Following a continué de se diversifier, couvrant de plus en plus de marchés et d'instruments financiers.
- Pendant la crise financière de 2008, de nombreux fonds de Trend Following ont généré des rendements positifs, soulignant son rôle en tant que stratégie de gestion des risques et de diversification de portefeuille.
- Les investisseurs institutionnels ont commencé à adopter cette stratégie pour réduire leur exposition aux marchés traditionnels.

Années 2010-2020 : L'ère de la technologie

- L'essor de la technologie a révolutionné le Trend Following, avec l'adoption généralisée de systèmes de trading automatisés et algorithmiques.
- Les ETF de tendance ont vu le jour, permettant aux investisseurs individuels de suivre passivement des tendances spécifiques à l'aide de produits négociés en bourse.
- L'automatisation a amélioré l'exécution des signaux de trading, rendant le Trend Following plus efficace.

Années 2020 et au-delà : La persistance

- Le Trend Following reste une stratégie populaire, en particulier auprès des fonds de couverture spécialisés dans cette approche.
- Les marchés financiers continuent d'être marqués par l'incertitude, ce qui maintient l'attrait du Trend Following en tant que méthode de navigation dans des conditions imprévisibles.
- Les avancées technologiques continueront probablement à jouer un rôle clé dans l'évolution future de cette stratégie.

Le Trend Following a ainsi évolué d'une stratégie utilisée principalement dans les marchés des matières premières vers une approche globale appliquée à un large éventail de marchés et d'actifs (Hurst, Christopher (2015). Les avancées technologiques ont renforcé son efficacité, tandis que la diversification et la reconnaissance institutionnelle ont contribué à son adoption généralisée.

Elle reste une stratégie pertinente et recherchée par de nombreux investisseurs cherchant à gérer les risques et à obtenir des rendements dans des marchés volatils.

1-2 indicateurs et outils pour identifier et suivre les tendances :

Les investisseurs qui pratiquent le trend following utilisent une variété d'indicateurs et d'outils pour identifier et suivre les tendances des marchés financiers.

Les indicateurs et outils utilisés en trend following peuvent varier en fonction des préférences individuelles des investisseurs, de la période de temps sur laquelle ils tradent (court, moyen ou long terme) et des marchés financiers qu'ils ciblent (actions, matières premières, devises, etc.). En fin de compte, le choix des indicateurs et outils dépendra de la stratégie spécifique mise en place pour suivre les tendances.

Tableau 1 : Indicateurs et outils les plus couramment utilisés dans le trend following

Moyennes Mobiles (Moving Averages)	Les moyennes mobiles sont parmi les indicateurs les plus fondamentaux du trend following. Elles calculent la moyenne des prix sur une période donnée et permettent de lisser les fluctuations des prix (Kaufman, Perry J. 2013). Les moyennes mobiles simples (SMA) et exponentielles (EMA) sont souvent utilisées pour déterminer la direction de la tendance.
Indice de Force Relative (RSI - Relative Strength Index)	Le RSI mesure la force et la vitesse d'un mouvement de prix. Il oscille généralement entre 0 et 100 et est utilisé pour identifier les conditions de surachat et de survente (Murphy, John J. 2012). Les investisseurs en trend following l'utilisent pour confirmer la force d'une tendance.
Indicateur Directionnel Moyen (ADX - Average Directional Index)	L'ADX mesure la force d'une tendance sans considération de sa direction. Il peut aider les traders à déterminer si une tendance est suffisamment forte pour être suivie.
Bandes de Bollinger	Les bandes de Bollinger sont basées sur la volatilité des prix. Elles se composent de trois lignes : une moyenne mobile, une bande supérieure et une bande inférieure. Les investisseurs utilisent ces bandes pour identifier les niveaux de surachat et de survente, ainsi que les possibles retournements de tendance.

MACD (Moving Average Convergence Divergence)	Le MACD est un indicateur de suivi de tendance qui mesure la convergence et la divergence de deux moyennes mobiles exponentielles. Il est utilisé pour identifier les changements potentiels de tendance.
Parabolic SAR (Stop and Reverse)	Le Parabolic SAR est un indicateur qui fournit des signaux de trading en fonction de la direction de la tendance. Il peut être utilisé pour placer des ordres stop et inverser une position lorsque la tendance change.
Ichimoku Kinko Hyo	L'indicateur Ichimoku est plus complexe que les précédents et offre plusieurs composantes, dont la ligne de conversion, la ligne de base, le nuage Kumo et la ligne de retard. Il est utilisé pour évaluer la direction et la force d'une tendance, ainsi que pour identifier les niveaux de support et de résistance.
Volume des échanges	Le volume des échanges est souvent utilisé en conjonction avec les indicateurs techniques pour confirmer les mouvements de prix. Un volume élevé associé à une forte tendance peut indiquer que celle-ci est robuste.
Analyse de la tendance des prix	En plus des indicateurs techniques, les investisseurs en trend following analysent les graphiques de prix bruts pour identifier les tendances. Ils utilisent des outils tels que les lignes de tendance, les figures chartistes et les niveaux de support et de résistance pour repérer les opportunités de trading (Murphy, John J. 2012).
Systèmes de trading automatisés	De nombreux investisseurs en trend following utilisent des systèmes de trading automatisés (robots de trading) pour exécuter leurs stratégies. Ces systèmes sont programmés pour suivre les signaux générés par les indicateurs techniques et exécuter des ordres en conséquence.

Source : Auteurs

1-3 Les grands suiveurs de Tendance :

Outre les investisseurs célèbres, de nombreux théoriciens et gestionnaires de fonds ont contribué à façonner le trend following en tant que stratégie d'investissement et à en expliquer les principes. Ed Seykota est un trader qui a utilisé des systèmes informatiques pour suivre les tendances des marchés. Il a étudié au MIT et a été influencé par Richard Donchian et Edwin Lefèvre. Il a créé et amélioré ses propres modèles de trading basés sur des moyennes mobiles, des déclencheurs de tendance et la gestion du risque. Il a aussi souligné l'importance de la psychologie du trader. Il a cofondé AHL (Adam, Harding & Lueck), un des premiers fonds quantitatifs, et a vendu sa part à Man Group. Il a été interviewé dans le livre "Market Wizards" et a créé la "Trading Tribe" (Alexandre Baradez. 2019). Il a obtenu des rendements annuels moyens de plus de 30% sur plus de 40 ans. Il considère que le trend following est une méthode efficace pour profiter des

inefficiences des marchés, qui sont le résultat des comportements irrationnels des investisseurs. Il pense aussi que le trend following permet de s'adapter aux changements de régime des marchés, en étant flexible et réactif. Il affirme que le trend following requiert une discipline, une patience et une confiance en son système, ainsi qu'une gestion rigoureuse du risque et de la taille des positions. Il souligne également l'importance de la psychologie du trader, qui doit être compatible avec sa stratégie et éviter de se laisser influencer par ses émotions.

Michel Covel, est un auteur, un formateur et un consultant spécialisé dans le trend following, une stratégie de trading qui consiste à suivre les tendances des marchés à l'aide de systèmes informatiques basés sur des indicateurs techniques. Il a popularisé cette méthode auprès du grand public grâce à ses livres, ses podcasts, ses documentaires et ses formations. Il a notamment écrit le best-seller "Trend Following" en 2004, qui présente les principes, les avantages, les risques et les performances du trend following, ainsi que les témoignages de traders célèbres qui ont utilisé cette stratégie, comme Ed Seykota, Richard Dennis ou John W. Henry. Il a également créé le site web trendfollowing.com, qui propose des ressources, des conseils, des analyses et des services liés au trend following. Michel Covel est considéré comme une référence et une autorité dans le domaine du trend following, et il intervient régulièrement dans les médias financiers pour partager sa vision du trading et des marchés (Michael Covel, 2004).

David Harding est le fondateur de Winton Capital Management, un des plus grands fonds de couverture quantitatifs au monde. Il est un adepte du trend following, une stratégie de trading qui suit les tendances des marchés à l'aide de systèmes informatiques. Il a co-fondé AHL, un des premiers fonds quantitatifs, et a vendu sa part à Man Group. Il a créé Winton Capital Management en 1996, qui gère plus de 20 milliards de dollars d'actifs. Il a obtenu des performances annuelles moyennes de plus de 15% sur plus de 20 ans. Il a été interviewé dans le livre "Hedge Fund Market Wizards" et a partagé sa vision du trading et ses conseils aux investisseurs. Il est aussi un mécène, qui a fait un don record à l'Université de Cambridge, et qui a financé des projets de recherche sur la compréhension et la littérature du risque.

Jerry Parker est un ancien “Turtle Trader” formé par Richard Dennis dans les années 1980. Il a appris le trend following, une stratégie de trading qui suit les tendances des marchés à l’aide de systèmes informatiques. Il a reçu un compte de trading de 1 million de dollars de la part de Dennis, qu’il a fait fructifier en suivant les règles du système (The Hedge Fund Journal, 2020). Il a diversifié son portefeuille en incluant d’autres classes d’actifs, et a adapté son système aux évolutions du marché. Il a réalisé des performances annuelles moyennes de plus de 10% sur plus de 30 ans. Il a été interviewé dans le livre “The Complete TurtleTrader” et a partagé sa vision du trading. Il est aussi un promoteur du concept de “risk parity”, qui alloue le capital en fonction du risque de chaque actif. Il pense que le trend following est compatible avec cette approche, car il réduit le risque global du portefeuille. Il fait partie des figures emblématiques de la finance qui ont utilisé et expliqué le trend following (Richard Dennis, 1980).

2- Méthodologie de recherche et analyse des résultats :

L’étude de cas que nous proposons porte sur l’analyse financière de l’action Apple, l’une des plus grandes entreprises technologiques au monde, à travers l’utilisation de différents ratios financiers. Notre objectif est d’évaluer la performance et la rentabilité de l’entreprise à la base du logiciel de gestion financière AGICAP, qui vous permet de calculer les ratios financiers. Et ensuite, expliquer la tendance de l’action Apple sur la durée de 2019 à 2023. Par cela, notre étude répondra à la question suivante :

Comment peut-on donc évaluer la performance et la rentabilité de l’entreprise Apple, ainsi que sa stratégie de suivi de tendance sur les marchés boursiers, à partir de différents ratios financiers ?

Pour y répondre, nous utilisons différents ratios financiers pour mesurer sa performance et sa rentabilité, ainsi que sa capacité à suivre la tendance du marché boursier. Nous nous appuyons sur une méthode quantitative, fondée sur des données chiffrées et des calculs des différents ratios à partir du logiciel AGICAP. Dans ce rapport, nous allons analyser le comportement de l’action Apple sur une période de cinq ans, 2019 à 2023, à l’aide d’un graphique et de données fournies par Zonebourse. Nous allons notamment étudier la tendance générale de l’indice, les

fluctuations du prix, la courbe de la moyenne mobile simple (SMA) sur plusieurs périodes, les niveaux de résistance et de support, et la stratégie d'investissement du trend following.

Parmi les données de base que nous avons obtenues sont les suivantes :

- Capitalisation (USD) : 3 081 155 698 720
- Chiffre d'affaires (USD) : 383 285 000 000
- Nombre d'employés : 161 000
- CA / Employé (USD) : 2 380 652
- Flottant : 99.92 %
- Capitalisation flottante (USD) : 3 078 807 598 558
- Capital Moyen Quotidien Echangé : 0.31%

Nous allons ensuite analyser les résultats obtenus, en les comparant aux moyennes du secteur et aux attentes du marché. Nous allons également étudier l'évolution des ratios sur une période, afin de déterminer les tendances et les cycles économiques. Enfin, nous allons formuler des recommandations sur l'opportunité d'investir ou non dans l'action Apple, en tenant compte de sa performance financière, de sa stratégie de suivi de tendance et de son potentiel de développement.

2-1 Analyse de la performance financière de l'action Apple :

Tableau 2 : Évolution des indicateurs financiers clés d'Apple sur cinq ans

Période Fiscale : Septembre	2019	2020	2021	2022	2023
Chiffre d'affaires	260 174	274 515	365 817	394 328	383 285
EBITDA	76 477	77 344	120 233	130 541	125 820
Résultat d'exploitation (EBIT)	63 930	66 288	108 949	119 437	114 301
Marge d'exploitation	24,57 %	24,15 %	29,78 %	30,29 %	29,82 %
Résultat Avt. Impôt (EBT)	65 737	67 091	109 207	119 103	113 736
Résultat net	55 256	57 411	94 680	99 803	96 995
Marge nette	21,24 %	20,91 %	25,88 %	25,31 %	25,31 %
BNA	2,97	3,28	5,61	6,11	6,13
Free Cash Flow	58 896	73 365	92 953	111 443	99 584

Marge FCF	22,64 %	26,73 %	25,41 %	28,26 %	25,98 %
FCF Conversion (EBITDA)	77,01 %	94,86 %	77,31 %	85,37 %	79,15 %
FCF Conversion (Résultat net)	106,59 %	127,79 %	98,18 %	111,66 %	102,67 %
Dividende / Action	0,75	0,8	0,85	0,9	0,93

Source : auteurs

Le chiffre d'affaires de l'entreprise a augmenté de façon régulière entre 2019 et 2022, mais a légèrement baissé en 2023. Cela peut s'expliquer par :

- La concurrence accrue des autres fabricants de smartphones, notamment Samsung, Huawei et Google, qui ont lancé des modèles innovants et attractifs.
- La saturation du marché des smartphones, qui limite les opportunités de croissance et de renouvellement des appareils.
- Les tensions commerciales entre les États-Unis et la Chine, qui ont entraîné des restrictions et des taxes sur les importations et les exportations de produits technologiques.

L'EBITDA, le résultat d'exploitation (EBIT) et le résultat net ont également suivi la même tendance que le chiffre d'affaires, avec une croissance soutenue jusqu'en 2022 et une diminution en 2023. Ces indicateurs mesurent la rentabilité de l'entreprise à différents niveaux : l'EBITDA représente le résultat avant intérêts, impôts, dépréciations et amortissements, l'EBIT représente le résultat après déduction des charges financières et des dotations aux amortissements, et le résultat net représente le résultat après déduction des impôts.

Les marges d'exploitation et nette ont connu une amélioration significative entre 2019 et 2021, passant respectivement de 24,57 % à 29,78 % et de 21,24 % à 25,88 %. Cela signifie que l'entreprise a réussi à réduire ses coûts par rapport à son chiffre d'affaires et à accroître sa rentabilité. En 2022 et 2023, les marges se sont stabilisées autour de 30 % et 25 %, ce qui reste des niveaux élevés (TradingView). Le BNA (bénéfice net par action) a suivi la même évolution que le résultat net, en passant de 2,97 en 2019 à 6,13 en 2023. Cet indicateur permet de mesurer la

rentabilité par action et de comparer les performances entre les entreprises. Il se calcule en divisant le résultat net par le nombre d'actions en circulation. Le free cashflow (FCF) représente la capacité de l'entreprise à générer des flux de trésorerie disponibles après avoir financé ses investissements. Le FCF a augmenté de façon importante entre 2019 et 2022, mais a diminué en 2023. Cela peut s'expliquer par :

- La baisse du chiffre d'affaires, qui a réduit les entrées de trésorerie liées aux activités d'exploitation.
- L'augmentation des dépenses en capital, qui ont augmenté les sorties de trésorerie liées aux activités d'investissement. Apple a investi davantage dans la recherche et le développement, les acquisitions, les immobilisations corporelles et incorporelles, etc.
- Le versement de dividendes et le rachat d'actions, qui ont augmenté les sorties de trésorerie liées aux activités de financement. Apple a distribué une partie de ses liquidités à ses actionnaires, ce qui a réduit son FCF.

La marge FCF mesure le rapport entre le FCF et le chiffre d'affaires. Elle indique la part du chiffre d'affaires qui se transforme en trésorerie disponible. La marge FCF a connu une progression entre 2019 et 2022, atteignant un pic de 28,26 %, puis a baissé en 2023 à 25,98 %. La FCF conversion (EBITDA) mesure le rapport entre le FCF et l'EBITDA. Elle indique la capacité de l'entreprise à transformer son résultat opérationnel en trésorerie. La FCF conversion (EBITDA) a été supérieure à 75 % sur toute la période, ce qui est un signe de bonne performance. Elle a atteint un maximum de 94,86 % en 2020, puis a diminué en 2021 et 2023. La FCF conversion (résultat net) mesure le rapport entre le FCF et le résultat net. Elle indique la capacité de l'entreprise à transformer son résultat net en trésorerie. La FCF conversion (résultat net) a été supérieure à 100 % sur toute la période, ce qui signifie que l'entreprise a généré plus de trésorerie que de bénéfice. Elle a atteint un maximum de 127,79 % en 2020, puis a diminué en 2021 et 2023. Le dividende par action représente la part du résultat net distribuée aux actionnaires. Il a augmenté de façon régulière entre 2019 et 2023, passant de 0,75 à 0,93

(TradingView). Cela montre que l'entreprise a une politique de rémunération des actionnaires attractive et stable.

En conclusion, on constate que l'entreprise a réalisé de bonnes performances financières sur la période, avec une croissance du chiffre d'affaires, une amélioration des marges, une génération de trésorerie importante et une distribution de dividendes croissante. L'année 2023 a été marquée par un ralentissement de l'activité et de la rentabilité, mais les ratios restent à des niveaux satisfaisants. L'entreprise semble avoir une bonne maîtrise de ses coûts, de son cycle d'exploitation et de sa structure financière. L'action Apple est un exemple de valeur en trend following, car elle affiche une tendance haussière régulière et soutenue depuis plusieurs années.

Tableau 3 : Performance financière d'Apple de 2019 à 2023

Période Fiscale :	2019	2020	2021	2022	2023
Septembre					
Dette Nette 1	-	-	-	-	-
Trésorerie Nette	97 851	79 394	65 797	49 040	51 011
Leverage (Dette/EBITDA)	-	-	-	-	-
ROE (RN / Capitaux Propres)	55,9 %	73,7 %	147 %	175 %	172 %
Capitaux Propres	98 818	77 913	64 215	56 881	56 409
ROA (RN / Total Actif)	15,7 %	17,3 %	28,1 %	28,4 %	27,5 %
Total Actifs	352 119	331 203	337 445	351 879	352 669
Actif net par Action	5,09	3,68	3,84	3,18	4
Cash Flow Par Action	3,73	4,6	6,17	7,48	6,99
Capex	10 495	7 309	11 085	10 708	10 959
Capex / CA	4,03 %	2,66 %	3,03 %	2,72 %	2,86 %

Source : auteurs

En effet, les valeurs en trend following sont généralement des entreprises qui affichent une croissance régulière et rentable de leur chiffre d'affaires, de leur résultat net, de leur cash flow et de leur dividende. Ces indicateurs reflètent la bonne santé financière de l'entreprise, sa capacité à innover, à fidéliser ses clients et à rémunérer ses actionnaires. Ces entreprises ont souvent un avantage concurrentiel, une notoriété et une confiance du marché qui leur permettent de maintenir leur

tendance haussière sur le long terme. La trésorerie nette de l'entreprise est positive sur toute la période, ce qui signifie que l'entreprise dispose de plus de liquidités que de dettes. Cela témoigne d'une bonne solvabilité et d'une faible dépendance aux financements externes. Cette dernière, diminue entre 2019 et 2022, puis augmente légèrement en 2023. Cela peut s'expliquer par une utilisation des excédents de trésorerie pour financer des investissements, des acquisitions ou des dividendes.

Le ROE (return on equity) et le ROA (return on assets) mesurent la rentabilité des capitaux propres et du total des actifs de l'entreprise. Ces ratios sont très élevés sur toute la période, ce qui signifie que l'entreprise crée beaucoup de valeur pour ses actionnaires et qu'elle utilise efficacement ses ressources. Les indicateurs, augmentent de façon spectaculaire entre 2019 et 2021, puis se stabilisent en 2022 et 2023. Cela peut s'expliquer par une forte croissance du résultat net, une diminution des capitaux propres et une maîtrise du total des actifs. L'actif net par action et le cash flow par action mesurent la valeur comptable et la capacité de génération de trésorerie par action. Ces indicateurs sont importants pour les investisseurs, car ils permettent de comparer les performances entre les entreprises et d'évaluer le potentiel de croissance et de distribution de dividendes. Ils augmentent globalement sur la période, ce qui signifie que l'entreprise crée de la valeur et de la trésorerie pour ses actionnaires.

- Apple a réalisé une croissance importante de son chiffre d'affaires et de son résultat net, grâce à la forte demande pour ses produits et services, notamment l'iPhone, les services numériques, les accessoires et les Mac.
- Apple a bénéficié d'une amélioration de sa rentabilité et de sa marge opérationnelle, grâce à une meilleure gestion de ses coûts, à une optimisation de sa chaîne d'approvisionnement et à une diversification de son portefeuille
- Apple a racheté une partie de ses actions en circulation, ce qui a réduit le nombre d'actions et augmenté l'actif net par action et le cash flow par action. Entre 2019 et 2023, Apple a racheté environ 1,5 milliard d'actions, soit environ 8 % de son capital.

- Apple a maintenu un niveau élevé de liquidités et d'investissements, ce qui lui a permis de financer ses activités, de rémunérer ses actionnaires et de saisir des opportunités de croissance. Au 30 septembre 2023, Apple disposait de 191 milliards de dollars de trésorerie et de titres négociables.

Le capex (capital expenditure) représente les dépenses d'investissement de l'entreprise. Le capex / CA mesure le rapport entre le capex et le chiffre d'affaires. Ces indicateurs renseignent sur la stratégie d'investissement de l'entreprise, sa capacité à se développer et à maintenir son avantage concurrentiel. Les dépenses sont relativement stables sur la période, ce qui signifie que l'entreprise investit de façon régulière et proportionnelle à son chiffre d'affaires. Cela peut indiquer une stratégie de croissance organique, sans recours à des opérations de fusion-acquisition.

2-2 Analyse de la tendance de l'action Apple :

Figure 1 : Évolution du prix de l'action et des moyennes mobiles d'Apple sur cinq ans



Source : Zonebourse (Action Apple)

Le graphique montre l'évolution du prix de l'action Apple de 2019 à 2023, en utilisant des chandeliers japonais et des lignes de moyennes mobiles simples (SMA).

Les chandeliers japonais représentent les variations du prix de l'action sur une période donnée (un jour, une semaine, un mois, etc.). Chaque chandelier est composé d'un corps, qui indique le prix d'ouverture et de clôture de l'action, et de deux mèches, qui indiquent le prix le plus haut et le plus bas atteint par l'action. Un chandelier vert signifie que le prix a augmenté, tandis qu'un chandelier rouge signifie qu'il a baissé.

Les lignes SMA sont des indicateurs techniques qui calculent la moyenne des prix de l'action sur un nombre déterminé de périodes. Elles permettent de lisser les fluctuations du prix et de visualiser les tendances à long terme. Plus le nombre de périodes est élevé, plus la ligne SMA est lisse et retardée par rapport au prix actuel. Sur le graphique, on peut voir les lignes SMA (20), SMA (50), SMA (100) et SMA (200), qui correspondent respectivement aux moyennes des prix sur 20, 50, 100 et 200 périodes.

On remarque, que le prix de l'action Apple a connu une forte croissance entre 2019 et début 2021, passant de 116,36 à 180,71, soit une augmentation de 55,3 %. Cette croissance s'explique par les bons résultats financiers de la société, qui a bénéficié de la forte demande pour ses produits et services, notamment l'iPhone, les services numériques, les accessoires et les Mac. La ligne SMA (20) suit de près le prix, indiquant une tendance haussière soutenue.

Le graphique montre également que le prix de l'action Apple a connu une certaine volatilité entre début 2021 et fin 2023, avec plusieurs hauts et bas. Cette volatilité s'explique par les incertitudes liées à la pandémie de Covid-19, à la concurrence sur le marché des smartphones, à la pénurie de composants et aux litiges juridiques. La ligne SMA (50) suit le prix avec un léger décalage, indiquant des changements de tendance plus fréquents.

Et enfin, on constate que le prix de l'action Apple a repris sa croissance à partir de fin 2023, atteignant 197,6 \$ en juillet 2024, soit une augmentation de 9,3 % par rapport à son plus haut précédent (**Zonebourse**). Cette croissance s'explique par le lancement de nouveaux produits innovants, comme l'iPhone 14, l'Apple Watch 7 et les AirPods 3, ainsi que par l'amélioration de la situation sanitaire et économique. La ligne SMA (100) suit le prix avec un décalage plus important, indiquant une tendance haussière à moyen terme. La ligne SMA (200) suit le prix avec un

décalage encore plus important, indiquant une tendance haussière à long terme. En appliquant la stratégie du trend following à l'action Apple, on peut faire les observations suivantes :

- L'action Apple a affiché une tendance haussière forte et régulière entre 2019 et début 2021, ce qui a permis aux trend followers de réaliser des profits importants en achetant l'action et en la conservant sur cette période.
- L'action Apple a ensuite connu une tendance baissière plus volatile et moins marquée entre début 2021 et fin 2023, ce qui a obligé les trend followers à vendre l'action et à la racheter à plusieurs reprises, en fonction des signaux des indicateurs techniques. Cette période a été moins favorable aux trend followers, qui ont dû supporter des coûts de transaction plus élevés et des faux signaux plus fréquents.
- L'action Apple a finalement repris une tendance haussière plus nette et plus stable à partir de fin 2023, ce qui a offert aux trend followers une nouvelle opportunité de profiter de la hausse du prix de l'action.

On peut donc conclure que la stratégie du trend following a été pertinente vis-à-vis de l'action Apple sur la période de 2019 à 2023, mais qu'elle a également présenté des difficultés et des limites, notamment lors des phases de transition et de consolidation du marché.

Tableau 4 : Analyse technique de l'action Apple sur trois horizons de temps

	Court Terme	Moyen Terme	Long Terme
Tendance	Haussière	Haussière	Haussière
Résistance	203,9	209,69	230,97
Ecart / Rés.	-2,95 %	-5,63 %	-14,33 %
Ecart / Supp.	+6,16 %	+9,50 %	+23,25 %
Support	186,4	180,71	160,55

Source : Zonebourse / TradingView

Les données indiquent les niveaux de résistance et de support à court, moyen et long terme. La résistance est le niveau au-dessus duquel le prix a du mal à monter, car il rencontre une forte pression de vente. Le support est le niveau en dessous duquel le prix a du mal à descendre, car il rencontre une forte demande d'achat. Les résistances et les supports sont des zones psychologiques qui influencent le comportement des investisseurs. Ils peuvent être utilisés pour déterminer les objectifs de prix et les niveaux de stop-loss.

À court terme, la résistance est de **203,90 (Zonebourse)** et le support est de **186,40**. Le prix est actuellement à **197,83 (Zonebourse)**, ce qui représente un écart de **-2,95%** par rapport à la résistance et de **+6,16%** par rapport au support. Cela signifie que le prix est plus proche du support que de la résistance, ce qui est favorable à une poursuite de la hausse. Le prix pourrait viser la résistance à court terme comme objectif, et placer un stop-loss en dessous du support à court terme pour protéger son capital.

À moyen terme, la résistance est de **209,69** et le support est de **180,71**. Le prix est actuellement à **197,83**, ce qui représente un écart de **-5,63%** par rapport à la résistance et de **+9,50%** par rapport au support (**Zonebourse**). Cela signifie que le prix est également plus proche du support que de la résistance, ce qui confirme la tendance haussière. Le prix pourrait viser la résistance à moyen terme comme objectif, et placer un stop-loss en dessous du support à moyen terme pour limiter son risque.

À long terme, la résistance est de **230,97** et le support est de **160,55**. Le prix est actuellement à **197,83**, ce qui représente un écart de **-14,33%** par rapport à la résistance et de **+23,25%** par rapport au support (**Zonebourse**). Cela signifie que le prix est nettement plus proche du support que de la résistance, ce qui indique une forte tendance haussière. Le prix pourrait viser la résistance à long terme comme objectif, et placer un stop-loss en dessous du support à long terme pour sécuriser ses gains.

Tableau 5 : Évolution de la tendance de l'action Apple sur dix ans

Performances	Tendance
1 jour	-0,15 %
1 semaine	+1,11 %
Mois en cours	+4,17 %
1 mois	+5,25 %
3 mois	+13,07 %
6 mois	+6,38 %
Année en cours	+52,30 %
1 an	+44,97 %
3 ans	+54,74 %
5 ans	+382,81 %
10 ans	+893,84 %

Source : Zonebourse (Action Apple)

Les données indiquent que la tendance d'APPLE est globalement **haussière** sur le long terme, avec des performances impressionnantes sur 5 ans (+382,81%) et 10 ans (+893,84%). Cela signifie que l'action APPLE a connu une croissance soutenue et régulière au fil du temps, malgré des fluctuations à court terme dues à la volatilité du marché. La tendance haussière indique, que le prix est nettement plus proche du support de la résistance du range, ce qui suggère une forte pression acheteuse.

Le placement d'un stop-loss en dessous du support à long terme est recommandé, ce qui est une mesure de gestion du risque qui permet de limiter les pertes potentielles en cas de retournement de tendance. Sur les périodes plus courtes, la tendance d'APPLE est plus **variable**, avec des gains et des pertes alternés. Par exemple, sur 1 jour, l'action a perdu -0,15%, mais sur 1 semaine, elle a gagné +11,11%. Cela signifie que l'action APPLE est sensible aux événements et aux nouvelles qui affectent le marché et qui peuvent créer des opportunités ou des risques pour les traders à court terme.

Conclusion :

Le trend following n'est pas une stratégie sans faille, elle présente des inconvénients, comme les faux signaux, le faible ratio de gain, la tentation de couper les gains, ou les impôts sur les plus-values. Mais elle offre aussi des avantages,

comme la simplicité, le gain de temps, l'absence de besoin de prévoir le marché, ou la résilience face aux chocs. Sur le plan boursier, l'action Apple a connu une forte progression, passant de 157,74 dollars au 31 décembre 2019 à 196,15 dollars au 15 décembre 2023, soit une hausse de 24,3 %. L'entreprise bénéficie d'une valorisation élevée, avec une capitalisation boursière de 3 300 milliards de dollars au 15 décembre 2023, ce qui en fait la première entreprise mondiale par la taille du marché. Sur le plan macroéconomique et géopolitique, Apple doit faire face à plusieurs défis, qui peuvent affecter sa croissance et sa rentabilité. Parmi ces défis, on peut citer :

- La concurrence accrue des autres acteurs du secteur, notamment Huawei, Samsung, Xiaomi.
- La crise sanitaire liée à la pandémie de Covid-19, qui a perturbé la chaîne d'approvisionnement d'Apple, entraîné des fermetures temporaires de magasins, et réduit le pouvoir d'achat des consommateurs.
- Les tensions commerciales et politiques entre les États-Unis et la Chine, qui ont entraîné l'imposition de droits de douane réciproques, et qui ont affecté les ventes d'Apple en Chine.
- Les réglementations environnementales et sociales, qui exigent d'Apple qu'elle réduise son empreinte écologique, qu'elle respecte les droits de l'homme et les normes de travail dans sa chaîne d'approvisionnement.

Apple s'efforce de répondre à ces exigences, en utilisant des matériaux recyclés, en s'approvisionnant en énergie renouvelable, en soutenant des initiatives sociales, et en renforçant la sécurité de ses produits. Toutefois, Apple doit faire face à des coûts supplémentaires, et à des pressions de la part des autorités, des ONG, et des consommateurs.

En conclusion, investir dans l'action Apple en adoptant la stratégie du suivi de tendance, peut être une bonne idée, car l'entreprise dispose de nombreux atouts, comme sa capacité d'innovation, sa fidélisation de ses clients, sa rentabilité, et sa valorisation. Toutefois, il faut être conscient des risques auxquels Apple est confrontée, comme la concurrence, la crise sanitaire, les tensions géopolitiques, et les réglementations environnementales et sociales. Et éventuellement il faut viser à capturer les grands mouvements du marché. Il faut donc être prudent, et diversifier son portefeuille d'investissement.

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La gouvernance d'entreprise : Un déterminant du management du risque bancaire

Corporate governance:
A determining factor in banking risk management.

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Résumé : L'objectif de notre étude est de proposer la structure de propriété et le conseil d'administration comme deux critères novateurs du management du risque. Notre approche mixte, combinant une étude qualitative et exploratoire avec 7 dirigeants et une étude quantitative confirmatoire menée auprès de 78 dirigeants, visait à évaluer l'impact de ces mécanismes sur le risque de défaillance de l'entreprise.

Les résultats démontrent de manière significative l'influence de la structure de propriété et du conseil d'administration sur le risque de défaillance. Ainsi, l'examen des interactions entre les différents acteurs du système de gouvernance révèle une relation d'accompagnement et de complémentarité plutôt qu'une relation de discipline.

Notre étude confirme que la configuration de la structure de propriété et la composition du conseil d'administration jouent un rôle clé dans la prévention du risque de crédit de l'entreprise. Ainsi, ces résultats suggèrent que l'optimisation de ces mécanismes peut non seulement réduire le risque de défaillance, mais également une perspective pour une approche globale et proactive du risque de crédit bancaire.

Mots-clés : Structure de propriété, Gouvernance, Conseil d'administration, défaillance d'entreprise

Abstract: The aim of our study is to propose ownership structure and board of directors as two innovative risk management criteria. Our mixed-method approach, combining a qualitative, exploratory study with 7 executives and a confirmatory quantitative study with 78 executives, aimed to assess the impact of these mechanisms on the risk of corporate failure. The results significantly demonstrate the influence of ownership structure and board of directors on default risk.

Thus, examination of the interactions between the various players in the governance system reveals a relationship of support and complementarity rather than one of discipline. Our study confirms that the configuration of the ownership structure and the composition of the board of directors play a key role in preventing corporate credit risk. Thus, these results suggest that optimizing these mechanisms may not only reduce the risk of default, but also provide a perspective for a comprehensive and proactive approach to bank credit risk.

Keywords: Ownership structure, Governance, Board of directors, business failure.

Introduction :

L'entreprise qui décide de financer sa croissance par endettement bancaire rentre dans une relation de long terme avec la banque. Cette dernière se trouve face à un risque de non-remboursement des fonds prêtés. Ce risque, communément appelé "risque de crédit", est d'autant plus grand que les conflits d'agence impliquant les dirigeants et les actionnaires sont importants.

Cette situation conflictuelle émane du comportement opportuniste et de l'attitude discrétionnaire des dirigeants. En effet, ces derniers prévalent leurs intérêts personnels sur ceux de l'entreprise et de ses partenaires. Ainsi, les actionnaires, propriétaires de la firme se trouvent contraints d'instaurer des mécanismes de contrôle et de surveillance de ces dirigeants.

Bien qu'au début de leur apparition, ces mécanismes dits de gouvernance avaient pour seul but de protéger les intérêts des actionnaires, leur rôle s'est reconsidéré dans le cadre d'une vision partenariale pour intégrer l'ensemble des parties prenantes de l'entreprise y compris la banque. Cette dernière peut être soucieuse de la qualité de la gouvernance au sein de l'entreprise emprunteuse puisque le contrôle exercé par ces mécanismes peut influencer la gestion de l'entreprise et plus particulièrement sa politique d'investissement. Ceci dit, au moment où les banques marocaines se mobilisent pour tracer les perspectives d'une relance inclusive après la crise sanitaire, l'intégration des mécanismes de gouvernance pourrait-elle représenter une solution innovante au problème de défaillance des entreprises ?

Une fois instaurés, ces mécanismes sont supposés agir sur le comportement du dirigeant et sur l'asymétrie d'information marquant la relation de crédit. Pour s'enraciner dans l'entreprise, un dirigeant malsain peut adopter un

comportement opportuniste et opter pour des investissements spécifiques où il est le seul à connaître leurs rouages. De ce fait, il faut se poser la question des caractéristiques de gouvernance qui contribuent à mieux contrôler le dirigeant. Ce contrôle peut préserver les intérêts de la banque en réduisant les risques d'aléa moral et/ou de sélection adverse marquant la relation de crédit.

La problématique de ce travail s'inscrit dans la suite des travaux visant à identifier les déterminants du risque de crédit des banques. Ainsi, Nous nous interrogeons sur la mesure dans laquelle les mécanismes de gouvernance, en particulier la structure de propriété et le conseil d'administration influencent le risque de crédit bancaire. En effet, au-delà des facteurs financiers du risque, nous avons fait le choix d'examiner l'influence de deux mécanismes internes de gouvernance sur le risque de défaillance des entreprises marocaines. En explorant l'interaction entre la structure de propriété, le conseil d'administration et le dirigeant, nous analyserons les principaux moyens dont disposent ces mécanismes pour réduire le risque de défaillance de l'entreprise.

1 Revue de littérature et développement des hypothèses de recherche :

1.1 La structure de propriété :

Dans le cadre d'un crédit d'investissement, les indicateurs financiers ne sont pas les seuls déterminants du risque de crédit retenu par les banques. Les indicateurs organisationnels peuvent également servir de signal de la qualité de l'emprunteur. La gouvernance d'entreprise, en l'occurrence, à travers ses mécanismes internes et externes peut jouer un rôle dans la prévention du risque de défaut de l'emprunteur.

En effet, ces mécanismes trouvent leurs origines dans les travaux de (Berle et Means 1932) qui ont soulevé la question de séparation des fonctions de propriété et de contrôle au niveau des firmes managériales. Pour eux, l'entreprise moderne a changé radicalement les bases de la propriété privée. La mainmise des dirigeants sur la richesse de l'entreprise, a fait que ces derniers se sont dotés d'un pouvoir sur l'entreprise et ses ressources. Ainsi, (Berle et Means 1932) estiment que le développement des firmes managériales a changé les rapports de force dans l'entreprise moderne. En effet, l'abandon du contrôle direct des actionnaires et la

concentration de leur richesse dans des actions immatérielles a réduit leur champ de manœuvre sur la propriété physique au profit d'une direction unifiée.

Une autre analyse des problèmes posés par la direction centralisée de la firme a été apportée par (Alchian et Demsetz 1972). En qualifiant l'actionnaire de créancier résiduel de l'entreprise, ces auteurs lui attribuent un rôle de contrôle des performances des membres de l'équipe de production. En l'absence d'un contrôle efficace, ces derniers adoptent un comportement opportuniste et sont enclins à réduire leur contribution.

Par ailleurs, (Jensen et Meckling 1976), les pères fondateurs de la théorie de l'agence affirment les constats de (Berle et Means 1932) et (Alchian et Demsetz 1972). Ils mettent davantage l'accent sur les conflits d'intérêt marquant les rapports entre les actionnaires et les dirigeants. Ils affirment que la séparation existante entre les propriétaires, qui assument le risque, et les dirigeants qui gèrent la firme est de nature à renforcer le pouvoir discrétionnaire de ces derniers. Par ailleurs, (Fama et Jensen 1983) affirment qu'une grande part des coûts d'agence que subissent les actionnaires est due à la séparation de la propriété et du management de la firme.

La structure de propriété a été présentée jusqu'à présent dans une perspective disciplinaire. Un changement important a été proposé par (Charreaux 2002). En fondant son analyse sur les limites de l'approche classique de gouvernance, il propose d'élargir le rôle de l'actionnariat dans le contrôle de l'entreprise à une dimension cognitive. Par ailleurs, ce même auteur a proposé d'accompagner à cette approche cognitive une approche comportementale du rôle de l'actionnaire dans l'entreprise.

Les recherches évoquées, bien qu'ils attribuent à l'actionnaire la mission de protéger les intérêts des actionnaires, ceux des créanciers financiers semblent être négligés au niveau de ces analyses. Limiter le contrôle des actionnaires à une vision actionnariale ne permet-il pas de préserver les intérêts de la banque ? La structure de l'actionnariat a-t-elle une influence sur le management de l'entreprise ? Dans quelle mesure la présence de bloc de contrôle d'actionnaire réduit-il les risques de défaillance de l'entreprise ?

De là, nous formulons la première hypothèse H1 de cette recherche qui s'énonce comme suit : la concentration du capital est négativement liée au risque de défaillance de l'entreprise.

1.2 Le conseil d'administration :

L'un des mécanismes les plus influents d'un système de gouvernance est le conseil d'administration. Dans une perspective partenariale de la gouvernance, le conseil d'administration veille non seulement sur l'intérêt des actionnaires mais également celui de l'ensemble des parties prenantes Charreaux, G. (2015). Son rôle est double : d'une part, il accompagne les dirigeants dans l'atteinte des objectifs stratégiques de l'entreprise, d'autre part, il est mandaté par les actionnaires pour contrôler les dirigeants. En mettant en place des mesures à la fois incitatives et coercitives, le conseil d'administration peut aligner les intérêts des dirigeants à ceux des partenaires internes et externes de l'entreprise et réduire par conséquent les problèmes d'agence (Denis & McConnell, 2003).

Le conseil d'administration a-t-il un impact favorable sur la prévention du risque de défaut de l'entreprise? Cette relation varie en fonction des caractéristiques de la firme. Dans les grandes entreprises à capital dispersé, le conseil d'administration joue un rôle disciplinaire tandis qu'il est moins actif dans les moyennes entreprises où les actionnaires détiennent le contrôle de l'entreprise (Bouraoui, 2021). Par ailleurs, la fonction du conseil d'administration est aussi influencée par le cadre réglementaire et juridique de chaque pays. C'est le cas par exemple aux États-Unis où les scandales financiers récents ont remis en cause l'efficacité des conseils et ont donné lieu à une nouvelle législation exigeant une majorité d'administrateurs indépendants dans le conseil. Le contrôle exercé par le conseil d'administration est-il dans l'intérêt de la banque ? et conduit-il à réduire le risque de crédit de l'entreprise ? Nous déclinons ces questions en étudiant dans un premier temps le rôle du conseil d'administration dans la réduction du risque de crédit, puis les caractéristiques qui conditionnent son efficacité.

1.2.1 Le rôle du conseil d'administration dans la gestion du risque de défaillance :

Dans une relation de crédit, la banque est supposée connaître la réalité économique de la firme sur toute la durée de prêt. Ceci n'est pas une tâche facile au vu des imperfections informationnelles qui marquent cette relation (Ferguson & Lam, 2023). Comme partie externe à l'entreprise, la banque fonde son analyse sur les seules informations communiquées par le dirigeant. Or, ce dernier peut être tenté de manipuler, dissimuler, voire même frauder pour des fins personnelles (Jensen et Meckling 1976).

De nombreux travaux ont étudié le lien du conseil d'administration avec la gestion du risque global et l'entreprise (Lajili et Zéghal 2005); (Bérard et Teyssier 2018) parmi tant d'autres. Cependant, nous ne connaissons aucune étude examinant de près le rôle dudit conseil sur le risque de défaut de la firme. Bien que ce dernier fasse partie des risques que l'entreprise cherche à limiter à travers des stratégies dites de gestion des risques, celui-ci, à notre avis, a un aspect particulier qui le distingue des autres risques financiers.

En fondant notre analyse sur la théorie d'agence, le risque de crédit peut amener d'un comportement opportuniste du dirigeant, qui peu soucieux de l'intérêt de la firme et encore moins celui des partenaires financiers, peut être incité à investir dans des projets risqués et peu rentables. Une telle attitude managériale risque de conduire la firme à une situation de détresse et éventuellement à un défaut de remboursement d'où le rôle potentiel que peut jouer le conseil d'administration dans la réduction du risque de crédit.

Dans cet état d'esprit, le conseil d'administration s'assure du niveau de risque afférent aux projets de la firme pour en faire un rapport aux partenaires externes. Celui-ci servira de base à la banque pour ajuster ses prévisions de risque relatif aux projets financés. Plus ces informations sont fiables, plus meilleure l'évaluation faite par la banque. Autrement dit, la divulgation des informations, la transparence, et l'exactitude des données comptables et financières relatives aux investissements objets de financement sont autant d'indicateurs qui facilitent la gestion du risque de la part de la banque. Par exemple, une dégradation de la situation financière de la firme conduit la banque à prendre des mesures d'ajustement pour éviter tout risque de défaut.

Une fois le lien entre le système de gouvernance et la gestion du risque de crédit établi, il nous semble utile de nous arrêter sur la composition du conseil d'administration qui non seulement affecte l'efficacité du conseil, mais peut contribuer sensiblement à la réduction des risques.

1.2.2 La composition du conseil d'administration et son effet sur le risque de défaillance de l'entreprise :

Le conseil d'administration semble être l'organe de gouvernance le plus étudié dans la littérature financière. Son importance émane de son rôle clé de réduction des conflits d'agence, origines de la naissance des théories de gouvernance (Shleifer et Vishny 1997). De nombreuses études ont examiné les caractéristiques de conseil d'administration notamment en rapport avec d'autres variables, telles que la performance, la création de valeur, le risque du côté de la banque, la divulgation financière et bien d'autres. Les questions les plus fréquemment soulevées dans ces travaux se rapportent à la taille du conseil, la nature des administrateurs, et la diligence. De ce fait, plusieurs questions méritent d'être posées : quelles sont les qualités requises d'un administrateur ? Ou encore, quel est le nombre optimal des administrateurs dans un conseil ? Faut-il révoquer les administrateurs non indépendants ?

À l'instar de ces interrogations, nous analysons les caractéristiques et la composition optimales du conseil d'administration. Le but que nous cherchons à ce niveau est de vérifier si une bonne gestion du risque de crédit est tributaire de la qualité du conseil d'administration. Dans cette optique, nous étudions l'effet des caractéristiques dudit conseil sur la prévention du risque de crédit à l'échelle de la firme.

1.2.2.1 La taille du conseil d'administration et son effet sur le risque de défaillance de l'entreprise :

Le nombre d'administrateurs a été amplement étudié dans la littérature de gouvernance. Selon la théorie d'agence, la taille du conseil d'administration revêt d'une importance particulière. Plus le nombre d'administrateurs est réduit, de 7 à 8 administrateurs (Jensen 1993) plus ce mécanisme de contrôle est efficace. D'autant plus que des études en psychologie montrent que plus la taille du groupe est

importante, moins sont bonnes les décisions Charreaux, G. (2000) Ainsi, une taille élargie du conseil d'administration risque d'entraver son efficacité et entraîner des problèmes de coordination et de communication (Lipton et Lorsch 1992). Cette situation amène sans doute à la création de coalition entre les administrateurs, source de conflit et laisse le champ ouvert au dirigeant pour continuer à prévaloir ses propres intérêts.

Ces imperfections liées au nombre élargi d'administrateurs sont éloignées en présence d'un nombre restreint d'administrateurs. Au sein d'un conseil d'administration de taille limitée, la coordination est plus efficace et les décisions sont plus rationnelles. Les administrateurs évaluent rapidement la performance des dirigeants et sont capables de le révoquer facilement Krifa, N., & Maati, J. (2017). Au Maroc, la loi sur les sociétés anonymes prévoit un minimum de trois administrateurs et 15 au maximum pour les sociétés faisant appel à l'épargne publique. Ainsi, le nombre moyen d'administrateurs se situe à 7 par entreprise (Enquête établie par l'Institut Marocain des Administrateurs (IMA), 2013, p 15).

Ainsi, la deuxième hypothèse de ce travail peut se formuler ainsi : La taille du conseil d'administration influence significativement le risque de défaut d'entreprise.

1.2.2.2 L'indépendance des administrateurs et son effet sur le risque de défaillance de l'entreprise :

L'indépendance des membres du conseil d'administration est vérifiée à travers deux aspects : la séparation entre la fonction de direction et de présidence du conseil et le degré d'indépendance des administrateurs (Godard et Schatt 2000). La présence d'administrateurs indépendants est d'une extrême importance, car leur unique objectif est de représenter les actionnaires et protéger leurs intérêts. Notons la présence de deux autres groupes d'administrateurs :

Les premiers sont issus de l'intérieur de la firme, ils occupent des postes dans différentes fonctions opérationnelles. La présence de ces membres dans le conseil d'administration est expliquée par leurs compétences et connaissances des activités de leur firme. Généralement, ils sont des salariés affiliés à l'équipe managériale. Ce lien d'affiliation réduit leur contrôle et leur influence sur les décisions prises par la direction.

Une deuxième catégorie d'administrateur vient de l'extérieur de la firme. Ils sont affiliés à l'entreprise et donc non indépendants. Il s'agit entre autres des cas de participations croisées où deux firmes peuvent s'échanger des sièges au niveau de leur conseil d'administration. Cette réciprocité trouve son explication dans la théorie d'indépendance envers les ressources (Salancik et Pfeffer 1978). Cette théorie repose sur l'idée selon laquelle les firmes sont contraintes d'entretenir des liens avec leur environnement afin d'obtenir des ressources nécessaires à leur survie. Sur ce registre, l'actionnariat bancaire représente un exemple parfait de cette relation. En disposant d'un siège au conseil d'administration de la firme cliente, la banque exerce un pouvoir sur la direction et suit de près l'évolution de la situation financière de celle-ci.

Ainsi, la troisième hypothèse de ce travail s'énonce comme suit : L'indépendance du conseil d'administration influence significativement le risque de défaut de l'entreprise.

2 Méthodologie et instruments de mesure :

Notre étude s'appuie sur une méthodologie mixte, combinant des approches qualitatives et quantitatives, afin d'explorer de manière approfondie le rôle des mécanismes de gouvernance dans la gestion du risque de défaillance des entreprises marocaines. Ainsi, le terrain d'investigation de notre enquête est composé d'un échantillon aléatoire d'entreprises marocaines issues de divers secteurs d'activité. Le but est d'étudier la perception des dirigeants de l'effet potentiel des mécanismes de gouvernance comme une solution managériale innovante au problème de gestion du risque de défaillance. Le choix de se concentrer sur les dirigeants est crucial, car ils occupent une position centrale dans les discussions théoriques sur la gouvernance d'entreprise.

L'étude sur le terrain comporte deux phases distinctes : une phase exploratoire, réalisée à travers des entretiens semi-directifs, et une phase confirmatoire, basée sur un questionnaire. Dans la première phase, le guide d'entretien a été administré à un groupe restreint de répondants, composé de 7 dirigeants actifs dans la ville de Casablanca. L'objectif était d'explorer en profondeur les perceptions des dirigeants, et l'analyse thématique a été appliquée au corpus des entretiens, découpant transversalement les données pour identifier les thèmes émergents.

Suite à cette phase exploratoire, un questionnaire a été conçu et administré à un échantillon plus vaste de répondants, représentant divers secteurs d'activité. La diffusion des questionnaires a été effectuée en ligne, en utilisant des plateformes telles que LinkedIn pour cibler les dirigeants d'entreprise. Parmi les 215 dirigeants contactés, seulement 78 questionnaires ont été dûment remplis après le dépouillement des résultats, reflétant un taux de réponse de 36%, expliqué par la disponibilité des adresses e-mails et la complétude des questionnaires obtenus. Les données analysées ont ensuite été traitées à l'aide du logiciel SPSS 21."

Tableau 1 : Caractéristiques de l'échantillon

Questionnaires	Distribués	Récupérés	Pourcentage
Divers secteurs	215	78	36%

3 Résultats et interprétations :

L'analyse approfondie des résultats de notre enquête s'est concentrée sur deux axes fondamentaux. Le premier axe a scruté l'impact de la structure de propriété, cherchant à déterminer dans quelle mesure la concentration du capital influence le risque de défaillance des entreprises. Nous avons entrepris une évaluation minutieuse des variations entre les entreprises à concentration élevée et celles à concentration faible.

Le deuxième axe d'investigation s'est attardé sur la mesure de l'effet des caractéristiques du conseil d'administration sur le risque de défaillance de l'entreprise. À ce niveau, notre objectif était de dévoiler le rôle spécifique joué par la taille et l'indépendance des administrateurs dans la prévention du risque de défaillance de l'entreprise.

Pour étayer nos conclusions et assurer la validité des résultats, nous avons opté pour une analyse de la variance (ANOVA) pour les deux axes d'investigations. Ce choix s'est justifié par notre volonté d'apporter une contribution significative et fondée à la compréhension du lien entre la gouvernance d'entreprise et la gestion du risque au sein des entreprises étudiées.

3.1 La gouvernance d'entreprise : facteur réducteur de risque et créateur de valeur :

En examinant les résultats de l'étude qualitative, nous remarquons que la majorité de nos enquêtés perçoivent positivement le rôle de la gouvernance d'entreprise dans la prévention du risque de défaillance.

En effet, une entreprise disposant d'un système de gouvernance est plus disposée à survivre. Cela se manifeste au niveau de la qualité des décisions prises par les dirigeants. Ces derniers sont moins incités à prendre des décisions risquées et agissent avec prudence.

Par ailleurs, l'influence des actionnaires majoritaires n'est pas sans effet sur la performance de l'entreprise. Ces derniers contrôlent les dirigeants et agissent sur les décisions stratégiques engageant l'avenir de la firme. Ainsi, nos répondants se mettent tous d'accord sur le rôle déterminant du conseil d'administration dans la réduction du risque de défaillance de l'entreprise. Pour la majorité des dirigeants interrogés, les caractéristiques du conseil d'administration cautionnent son efficacité.

Le rôle attribué au conseil d'administration est tributaire de sa taille du conseil et de sa composition. Conformément à la théorie d'agence, plus le nombre d'administrateurs externes est élevé, plus est l'efficacité du système de gouvernance. Bien entendu, un administrateur indépendant est plus incité à contrôler objectivement les dirigeants. Il intervient dans l'intérêt non seulement des actionnaires de l'entreprise, mais également ceux de partenaires de l'entreprise notamment financiers.

A la suite de l'analyse qualitative des entretiens-semi directifs avec les dirigeants d'entreprises des 7 entreprises explorées, nous présentons l'analyse statistique causale permettant de tester les hypothèses formulées. Pour cela, nous analysons successivement l'influence des variables « Concentration du capital », « Taille du CA » et « Indépendance du CA »

3.2 L'influence de la structure du capital sur le risque de défaut de l'entreprise :

Dans le but d'analyser le lien entre la structure de propriété et le risque de défaut, nous avons scindé notre échantillon en deux groupes. Le premier regroupe les entreprises caractérisées par une structure de capital concentrée. Pour les

entreprises de ce groupe, la variable associée Conc_capprend la valeur 1. Le second groupe G2 est composé d'entreprises dont le capital est dispersé entre plusieurs actionnaires. Pour ces entreprises, la variable associée Conc_capprend la valeur 0.

Tableau 2 : Les moyennes de la variable Risk-déf sur les groupes G1 et G2

Concentration du capital	N	Moyenne	Écart-type	Erreur standard de la moyenne
Risk-Déf ,00	36	,3733	,49583	,03960
1,00	42	,3333	,47583	,06803

La distribution de la variable Risk-Déf étant normale, le test paramétrique associé à l'analyse de la variance a une signification. Le tableau de résultat dégagé de SPSS montre que $P(D/H_0)=0,0334 < 0,05$. Ainsi, les données collectées ne sont pas cohérentes avec l'hypothèse nulle d'égalité des moyennes entre les deux groupes au seuil de 5%.

Tableau3 : ANOVA de la variable Risk_déf suivant le facteur Con_Cap

		Somme des carrés	ddl	Carré moyen	F	Sig.
Risk_défaut * Con_Cap	Entre groupes (Combinée)	,048	1	,048	,189	,0334
	Intra-groupes	5,645	76	,252		
	Total	5,693	77			

Toutefois, le coefficient ($\text{Eta}^2 = 0,48/5,693 = 0,085$) ce qui signifie que la variable « concentration du capital » n'explique que 8,5% de la variation de la variable « Risque de défaut ». Ainsi, l'effet exercé est important ($\text{Eta}^2 > 0,01$) au sens de (Cohen 1988). Sur la base de ce résultat, nous considérons que l'effet de la concentration du capital sur le risque de défaut de l'entreprise est significatif.

Sur la base de ces résultats, nous concluons que l'effet de la concentration du capital sur le risque de défaut de l'entreprise est significatif, confirmant ainsi l'hypothèse H1. Cette conclusion est en cohérence avec les postulats théoriques de la théorie de l'agence, corroborant l'influence de l'actionnariat concentré sur le risque de crédit des entreprises. Cette influence s'observe particulièrement au niveau de la politique d'investissement, où l'activisme des actionnaires peut impacter la qualité des projets à investir et, par conséquent, le risque encouru par l'entreprise.

3.3 L'influence du conseil d'administration sur le risque de défaut de l'entreprise :

Afin d'analyser le lien entre les caractéristiques du conseil d'administration et le risque de défaut de l'entreprise, nous analysons successivement l'influence de la taille et de l'indépendance des administrateurs sur le risque que l'entreprise ait des difficultés financières.

La distribution de la variable « Intensité du risque de défaut » (Int_Risk) n'étant pas normale, le test de corrélation non paramétrique de Spearman renseigne une p-value ($p(D/H_0)=0,316$) non significative au seuil de 5%. Cela signifie que les données collectées sont cohérentes avec l'hypothèse nulle d'une corrélation entre les variables.

Tableau 4 : Paramètres de la régression (Int-Risk)

Modèle	R	R-deux	R-deux ajusté	Erreur standard de l'estimation
1	,031	,001	,004	1,37739

Le coefficient de corrélation linéaire entre les deux variables est $r=0,031$, avec un coefficient de détermination de $r^2=0,001$ ce qui indique qu'à peine 1% de la variation de la variable « Intensité du risque » est expliquée par la variable « Taille du conseil d'administration ». Ceci nous conduit par conséquent à réfuter l'hypothèse 2.

Pour l'analyse de l'intensité du risque avec l'indépendance du conseil d'administration, nous avons mobilisé deux groupes associés à la variable «

Indépendance du CA ». Le premier groupe est composé d'entreprises ayant au moins un administrateur indépendant, et le deuxième est composé d'entreprises qui n'ont aucun administrateur indépendant au sein de leur conseil d'administration. La distribution de la variable n'étant pas normale, la comparaison de moyennes non paramétriques sur les deux groupes est réalisée sur la base de tests de Mann-Whitney. Le p-value associé à ce test ($P(D/H_0)=0,0719$) est supérieur au seuil de 5%. Ceci signifie que les données ne sont pas cohérentes avec l'hypothèse nulle d'égalité des moyennes sur les deux groupes G1 et G2

Par ailleurs, l'analyse de la variance (ANOVA) sur les variables « Intensité du risque » (Int_Risk) en fonction du facteur « Indépendance du CA » (Indep_CA). Le coefficient $Eta^2 = 0,029/1,625 = 0,0178$ signifie que la variable « Indépendance du CA » n'explique que 17,53% de la variable « Intensité du risque ». Ce taux étant significatif au seuil de ($Eta^2 > 0,14$), nous considérons que la présence d'administrateurs externes au sein du conseil d'administration de l'échantillon étudié influence significativement le risque de défaut de l'entreprise. Par conséquent, nous confirmons l'hypothèse H3.

Tableau5 : ANOVA de la variable Int_Risk suivant le facteur Ind_CA

			Somme des carrés	ddl	Carré moyen	F	Sig.
Int_Risk* Indépendance du CA	Entre groupes	(Combinée)	,029	1	,029	,124	,725
	Intra-groupes		1,625	76	,232		
	Total		1,654	77			

À la lumière de ces résultats, la présence d'administrateurs indépendants au sein du conseil d'administration émerge comme un pilier essentiel dans la prévention du risque de défaut de l'entreprise. Les administrateurs, particulièrement ceux externes, apportent une vision impartiale et une expertise critique qui jouent un rôle déterminant dans l'amélioration de la qualité des décisions stratégiques prises par les dirigeants.

La valeur ajoutée de ces administrateurs indépendants transcende la simple protection des intérêts des actionnaires. Leur contribution s'étend à la promotion d'une gouvernance d'entreprise efficace, mettant l'accent sur la transparence et la performance globale de l'entreprise. En prenant part activement aux comités de surveillance et d'audit, ces administrateurs indépendants participent à l'établissement de normes élevées de conformité, renforçant ainsi la confiance des parties prenantes, y compris les institutions bancaires.

Allant au-delà des strictes contraintes réglementaires, l'influence des administrateurs se manifeste au niveau stratégique. Ils agissent en tant que partenaires stratégiques, accompagnant les dirigeants dans leurs choix stratégiques et contribuant ainsi de manière significative à la croissance durable de l'entreprise.

Conclusion :

Dans un contexte de reprise post-covid-19, les banques marocaines se retrouvent face au défi de relancer leur activité. En accumulant plusieurs créances en souffrance pendant la pandémie, elles font face à la double contrainte de continuer à financer les investissements et de préserver leurs équilibres prudentiels.

Dans cette perspective, les banques sont appelées à innover et revoir leur management du risque notamment du crédit. Ainsi, la pandémie Covid-19 a montré que les systèmes bancaires étaient incapables de prévoir la défaillance de leurs entreprises partenaires. Cela nous a conduit à penser à des outils de prévention de risque plus innovants.

Ce travail permet d'apporter un aperçu sur l'influence de certains mécanismes de gouvernance sur le risque de crédit des entreprises marocaines. Nos résultats montrent que la concentration du capital ainsi que l'indépendance du conseil d'administration influencent positivement le risque de défaut des entreprises de notre échantillon.

Bien que cette étude présente certaines limites liées notamment à la taille de l'échantillon retenu, elle permet d'éclairer les décideurs au niveau des banques marocaines sur l'importance des facteurs managériaux dans la prévention du risque de contrepartie.

S'il est admis que le débat sur la gouvernance des entreprises au Maroc se limite aux approches dites disciplinaires, la prise en compte des dimensions cognitives et comportementales pourrait à notre sens réduire davantage le risque de défaut des entreprises marocaines. Ceci est possible à travers l'apprentissage organisationnel qui, non seulement réduit les biais de jugements des dirigeants mais, représente également une source de création de valeur.

Ainsi, ce travail ouvre des pistes de recherche inexplorées, notamment dans le contexte marocain. De ce fait, les résultats de cette recherche méritent d'être complétés par une étude empirique en données de panel sur les sociétés marocaines cotées à la bourse de Casablanca.

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