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The Guarantee Pricing and the Analysis of the Automotive Branch Insurance Profitability in Tunisia

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ABSTRACT

The presented study thoroughly investigates the technical profitability of the Tunisian automobile insurance market using a quantitative research approach with interpretivism as its foundation. The study aims to offer insightful information about the dynamics and profitability of the sector by concentrating on the combined ratio and applying the S/P ratio calculation. The data show that the Tunisian auto insurance industry faces serious obstacles. The S/P ratios continually exceeded 100% from 2019 to 2021, indicating a chronic problem of low technical profitability. Notably, the civil responsibility guarantees considerably added to this imbalance, particularly in the "agricultural utility" and "2-wheel use" categories, with S/P ratios rising to frightening heights, like 937% in 2012. These findings highlight the pressing necessity for pricing modifications and a thorough comprehension of the nuances of the market. The Tunisian auto insurance industry must address underpricing concerns and increase overall profitability viable over the long run. This study offers helpful insights for policymakers and business experts trying to manage these difficult issues and promote a more vibrant insurance market.

INTRODUCTION

The Tunisian insurance landscape is dominated by the automobile insurance business, which makes a sizable financial contribution to the sector's overall profitability (Chikalipah & Makina, 2019). Despite facing significant structural issues, the car insurance business has recently shown extraordinary resilience and development. According to Fabris *et al.* (2021), to determine the sector's profitability, this paper conducts a thorough investigation of guarantee pricing in the context of automobile insurance in Tunisia. This research paper's main goal is to decipher the complex pricing structure governing various guarantees in Tunisia's auto insurance market, focusing on the optional and civil responsibility guarantees (Fabris *et al.*, 2021). In addition, the study will include identifying structural imbalances in the combined ratio and identifying their root causes by carefully examining the sinistrality-to-premium (S/P) [1]Ratios related to various forms of guarantees in the automotive insurance sector.

This research clarifies the examination of the technical profitability of the industry and offers helpful insights into the combined ratio and other important tools for profitability evaluation (Abou-Foul *et al.*, 2021). Second, it demonstrates a link between the combined ratio and sinistrality ratios, showing that they move in parallel directions between 2019 and 2021. Thirdly, it reveals a structural imbalance in the combined ratio throughout this period, which resulted in a deficit for the sector's insurance firms. Notably, the use of "agricultural utility" and "two-wheelers" over the years from 2010 to 2012 is principally responsible for this imbalance. The study also reveals that the S/P ratio for the whole automotive insurance branch is frighteningly high, indicating that premiums are not enough to pay the expenses the insurance firms incur in processing claims (Graham, 2018). The civil responsibility guarantee's shortcomings, which in 2011 registered a sinister ratio of around 200% and negatively impacted the sector's profitability, are substantially to blame for this problem.

The Automotive Insurance Sector of Tunisia: Profitability of the Sector

Recognizing that the vehicle insurance sector holds the top spot in terms of income creation in the insurance industry is crucial. According to statistics from 2021, the premiums granted in the car insurance industry totalled an astounding 1,199.738 million dinars (MD), which is a considerable increase from the 1,067.214 MD recorded in 2019. Automobile insurance maintains its position as the market leader, taking a sizeable portion of the premium market at a rate of 42.350% in 2021 compared to 44.20% in 2019. This is despite the significant institutional experience connected with this industry (Rudolph *et al.*, 2021). These numbers demonstrate the continued importance of the vehicle insurance market in Tunisia's insurance market.

Vehicle Insurance Sector in Tunisia: Market Share and Growth Rate

The vehicle insurance sector in Tunisia stands as the largest and most pivotal segment within the insurance industry, contributing to over 40% of the total gross written premium (GWP). This sector is poised for substantial growth, with an anticipated Compound Annual Growth Rate (CAGR) exceeding 7% throughout the period spanning 2021 to 2026 (GlobalData, 2022);

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Fitch Solutions, 2023; Mordor Intelligence.; 2023). Several driving forces underpin the burgeoning growth of the Tunisian vehicle insurance market. Initially, the escalating motorization rates in the country present a significant factor. According to Global Data (2022) statistics, the number of registered motor vehicles in Tunisia has been on a steady rise, climbing from 2.5 million in 2010 to 3.5 million in 2020. This trajectory is expected to persist, fueled by economic expansion and an upswing in disposable incomes.

Furthermore, there is a growing awareness among Tunisians regarding the importance of vehicle insurance (Zone, 2021). The study by Belloum & Ouni (2019), the increasing awareness of Automobile insurance in Tunisia can be attributed to various factors, including an uptick in traffic accidents, rising vehicle prices, and government initiatives geared towards promoting insurance penetration. The Tunisian insurance companies are diversifying their product portfolios to cater to the diverse needs of their customers (Karaa, 2017). For instance, some insurers now offer policies that cover vehicle damage resulting from natural disasters, such as floods and sandstorms (Ozor & Nyambane, 2022). Moreover, the Tunisian government has introduced measures aimed at enhancing insurance penetration and safeguarding consumer interests. One noteworthy initiative includes mandating insurance coverage for all new vehicles (Arfa & Achouri, 2008).

Challenges Faced by Automobile Insurance Sector in Tunisia

The Tunisian vehicle insurance market confronts several challenges. According to the market analysis study by Global Data (2023), the automobile insurance industry of Tunisia contends with a relatively high claims ratio owing to factors like elevated traffic accident rates, fraudulent claims, and steep vehicle repair costs. Moreover, Yin (2021) highlights that the sector operates in an intensely competitive environment, with over 20 insurance companies vying for market share. While the study also highlights that this competition has translated into lower premiums and a broader array of product choices for consumers, it has also made profitability a formidable challenge for insurance providers.

Additionally, the regulatory framework governing the Tunisian insurance industry presents hurdles, as the insurance industry is designed to protect consumers and ensure financial stability. Dhieb *et al.* (2020) highlight that some industry participants argue that these regulations can be cumbersome and stifle innovation. In essence, the vehicle insurance sector in Tunisia represents a substantial and expanding market. The sector's growth trajectory is expected to persist in the coming years, driven by the rising rates of motorization, growing awareness of insurance importance, and an expanding array of product offerings (Ofori-Boateng *et al.*, 2022). This resilience, despite the challenges, underscores the enduring significance of the vehicle insurance sector within Tunisia's insurance landscape.

LITERATURE REVIEW

According to Tidd & Bessant (2020), the technical profitability of the vehicle insurance market has long drawn considerable interest from the insurance community and academic study. For both business professionals and policymakers, it is essential to comprehend the variables that affect the profitability of automotive insurers. Industry data show a complicated picture. The rising number of automobiles on the road and many nations' insurance mandates have contributed to the global auto insurance market's consistent rise in recent years (Ogunkunle & Ahmed, 2019). Profitability, however, has fluctuated because of a number of causes. The study by Grace and Fenn (2019) emphasizes the significance of claims management and underwriting for technical profitability. It has also been discovered that insurers with strong pricing and risk assessment models typically do better in terms of profitability.

Furthermore, improvements in data analytics and telematics have given insurers the capacity to assess risk more accurately and customize rates, which has a favourable effect on their profitability (Eling & Lehmann, 2018). According to Rae *et al.* (2022), It is inconceivable to disregard the effects of external factors like economic conditions and regulatory changes. Research by Ames*et al.* (2018) highlights how regulatory changes may have a big impact on insurer profitability. For instance, modifications to liability rules or healthcare standards may affect how much a claim may cost. Profitability also heavily relies on investment revenue from insurers' portfolios. Low-interest rates, as seen in recent years, can reduce investment returns and increase the profitability of underwriting. As a result, technical profitability in the vehicle insurance industry is a complex problem driven by a variety of elements, including underwriting procedures, claims handling, legislative changes, and investment performance (Janků & Badura, 2021). Researchers and business professionals keep looking for novel ways to maintain and improve profitability in this dynamic sector.

Pricing of Guarantees in Automobile Insurance of Tunisia

Within the realm of motor insurance, the guaranteed price has critical significance. Given that charges are billed and paid prior to the occurrence of any nefarious occurrences, they constitute a crucial link in the functioning of insurance businesses. According to Keucheyan (2018), inadequate pricing may put the financial stability of insurance firms at risk, having a negative effect on both insurers and covered parties. Guarantees in vehicle insurance may be divided into two groups: those that are legally required to be provided and whose costs are subject to regulation, and those that are voluntary and provide both policyholders and insurers some degree of freedom (Inês *et al.*, 2020). Surprisingly, there aren't many thorough literature evaluations that explore technological profitability in this industry. The majority of currently conducted research generally focuses on topics like car

insurance claims, fraud detection, and the function of auto repair businesses. For instance, Cohen and Cavoli (2019) examined how auto insurance renewal decisions are made by examining all aspects accessible, including claims information. Similar to this, Ricciardi *et al.* (2023) have suggested ways to stop fraud in support of the special investigative teams at insurance firms. For each claim, they use picture analysis to retrieve crucial vehicle data. Additionally, Macedo *et al.* (2021) have investigated the part that auto repair businesses play in automobile insurance fraud and how they could help to lessen or exacerbate such illegal activities.

Optional Guarantees in the Tunisian Automobile Sector

Tunisia's vehicle insurance market provides a number of optional guarantees that let customers tailor their coverage to meet their unique requirements and preferences. According to Fischer-Daly & Anner (2021), the Tunisian Insurance Federation (FTUSA) regulates the pricing of these supplementary guarantees, which offer extra security above and beyond the required coverage. The Robbery Guarantee is one of these extra guarantees; it pays for harm caused by the insured vehicle disappearing or degrading as a result of a robbery or attempted theft. The cost of this guarantee is determined using a percentage of the car's market value that FTUSA specifies (Eldar, 2020). The Fire and Explosion Guarantee, which covers damage brought on by fire, explosion, spontaneous combustion, lightning strike, and other similar disasters, is another crucial choice. The premium for this guarantee is calculated as a proportion of the market value of the insured vehicle, the same as the robbery guarantee.

Accidental Damage with or without Collision is another optional assurance provided by Tunisian vehicle insurance providers (Kubwimana., 2022). The Guarantee option is essential since it pays for actual damages to the covered vehicle brought on by accidents, shocks, overturning, and other unavoidable occurrences. Pricing varies according to how the car is used and may include extra coverage from avalanches, riots, calamities, or terrorist attacks. The Force of Nature Guarantee kicks in after a natural disaster (Chakalian *et al.*, 2019). This guarantee covers losses brought on by storms, avalanches, floods, earthquakes, and other natural disasters. Individual insurance firms normally determine the cost of this assurance. The Glass Damage Guarantee, with the exception of a few select goods, covers unintentional glass component damage in vehicles. The cost of this assurance may differ across insurers. The Collision Accidental Damage Guarantee pays for repairs in cases of accidents involving other people's cars (Wang & Xu, 2018). The insured's selections for coverage limits and deductibles will determine the price for this assurance.

In instances of legal issues relating to covered incidents, the insured is supported financially and legally by the Defense and Recourse Guarantee against Special Insurance (Parker & Schaefer, 2021). The price of this guarantee varies between insurers and might be affected by the kind of coverage selected. The carried Persons Guarantee compensates people who aren't third parties, such as the driver, their loved ones, coworkers, and employees, to assure the safety of people being carried in the insured vehicle. According to Mutaqin & Usami (2019), the chosen coverage level and the total number of insured locations are used to determine the premiums for this guarantee. When operating the insured vehicle, the driver is explicitly protected by the Driver Plus Guarantee in the case of an accident.

The last option, the Accumulated Damage Guarantee (Specific to GAT Insurance), is designed specifically for automobiles under ten years old and includes coverage for theft, fire, and damage to the vehicle. The age of the vehicle and other considerations decide the insurance amount for this set of assurances (Schierman *et al.*, 2020). These supplementary assurances' availability and cost may differ across Tunisian insurance firms. When choosing coverage, policyholders should carefully assess their demands as well as the exact terms and circumstances of these assurances.

The Civil Responsibility Guarantee in the Automobile Insurance Sector of Tunisia

The Civil Responsibility (RC) Guarantee, a component of Tunisia's automotive insurance market, is crucial in ensuring that those hurt in accidents have access to financial support. It is required by the Tunisian Insurance Code and is made to pay for the insured's civil liability for harms brought on by the operation of a motor vehicle (Al-Mawla & Al-Mawla, 2021). The RC Guarantee financially shields the insured from claims stemming from mishaps, fires, or explosions brought on by their motor vehicle, as well as its trailers, equipment, and accessories. This warranty is essential because it guarantees that victims including other motorists, pedestrians, cyclists, and passengers receive compensation for harm and property damage brought on by the insured's vehicle.

The RC Guarantee's limitless bodily injury coverage sum is one of its standout features. This guarantees that victims are fairly paid even if the accountable party ends up becoming bankrupt. In this way, the guarantee works to safeguard the rights of accident victims (Schmitt, 2020). However, as stated in the Insurance Code, there are specified exceptions to the RC Guarantee. These include those working in the automotive industry (repair, maintenance, or trade), damages incurred by accident victims, drivers who lacked the necessary licenses at the time of the occurrence, and passengers sitting outside the car's bodywork. According to Tlili (2022), in Tunisia, the cost of RC insurance is based on a tiered system that considers both the type of vehicle being used and the horsepower of the engine. For various vehicle usage, including personal, commercial, agricultural, and more, different prices are presented in Table 01. encourage safe driving practices, the RC Guarantee also uses a bonus-malus system.

Civil Responsibility Insurance Tariffs for Users of Land Vehicles with Motor

Table 1: Pricing for business usage

Fiscal power of the engine in horses	2	3 to 4	5 to 6	7 to 10	11 to 14	15 and more
Price excluding tax in dinars	94	110	140	170	220	264

Table 2: Tariffs for transporting goods on your account

A) Price (excluding tax) of the vehicles whose gross weight does not exceed 3.5 Tons						
Fiscal power of the engine in horses	2	3 to 4	5 to 6	7 to 10	11 to 14	15 and more
Price excluding tax in dinars	145	171	214	262	338	405
B) Price (excluding tax) of the vehicles whose total weight exceeds 3.5 tons in DT						
	Price (excluding tax)					
Basic premium	257					
Additional premium.	21 for each additional ton whose total weight exceeds 3.5 ton					

Table 3: Transport of goods for the third parties

A) Vehicles whose gross weight does not exceed 3.5 tones: (Apply the tariff relating to the vehicles intended for the transport of goods on its account referred to A)	
B) Vehicles whose total weight exceeds 3.5 tones:	
	Price (excluding tax) in dinars
Basic premium	250
Additional premium.	4 for each additional ton whose total weight exceeds 3.5 ton

Table 4: Agricultural use

A) Vehicle whose gross weight does not exceed 3.5 tones: in TND						
Fiscal power of the engine in horses	2	3 to 4	5 to 6	7 to 10	11 to 14	15 and more
Price excluding tax	84	97	122	150	193	232
B) Vehicle whose total weight exceeds 3.5 tones in DT:						
	Price excluding tax					
Basic premium	The tariff relates to the vehicles intended for agricultural usage with a gross weight not exceeding 3.5 tons					
Additional premium	13 for each additional ton whose weight exceeds 3.5 Ton					

Table 5: Prices of machine and agricultural tractors in DT

Type of véhicules	**Price excluding tax**
Type 1	
Made of rubber with wheels	42
With tracks	31
Type II	117
Type III	
Made of rubber with wheels	84
With tracks	59
Type IV	177

Table 6: Prices for two-wheelers in DT

	Price excluding tax
Less than or equal to 125CC	62
Above 125CC	168

Sources: Circular No. 1/2017 of 28 February setting the tariff for civil responsibility insurance due to the use of motor land vehicles (General Insurance Committee (CGA)

Table 7: Use: Rental (5 seats without driver)

New Pricing (2014)				
	Annual		**Semestrial**	
	Net	**Tax**	**Net**	**Tax**
Civil responsibility	1139,033	136,684	569,517	68,342
Cost of the contract	40,000	4,800	40,000	4,800
Appeal to a third[2]	50,000	5,000	25,000	2,500
Robbery	79,102	7,910	39,551	3,955
Fire	82,902	8,290	41,451	4,145
FGVAC		0,300		0,300
FPAC		0,500		0,500
FGA		1,000		1,000
Total	**1555,522**	**1555,522**	**801,061**	**801,061**
	Robbery		**Fire**	
Basic premium	38,502		38,502	
Rate in %	4,06		4,44	
Surplus in each place				
Annual: 113,904			Tax: 13,668	
Semestrial: 56,952			Tax: 6,834	

Source:chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ftusanet.org/wp-content/uploads/2015/10/Tarif-6.pdf

Table 8: Use: Rural transport Vehicle value=10000D

New Pricing (2014)				
	Annual		**Semestrial**	
	Net	**Tax**	**Net**	**Tax**
Civil responsibility	877,152	105,258	438,576	52,629
Cost of the contract	40,000	4,800	40,000	4,800
Appeal to a third[3]	50,000	5,000	25,000	2,500
Robbery	79,102	7,910	39,551	3,955
Fire	82,902	8,290	41,451	4,145
FGVAC		0,3		0,3
FPAC		0,5		0,5
FGA		1		1
Total	**1262,214**	**1262,214**	**654,407**	**654,407**
	Robbery		**Fire**	
Basic premium	38,502		38,502	
Rate	4,06%		4,44%	

Source: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ftusanet.org/wp-content/uploads/2015/10/Tarif-6.pdf

Table 9: Use of taxi (+4 places) Vehicle value=6000D

New Pricing (2014)				
	Annual		**Semestrial**	
	Net	**Tax**	**Net**	**Tax**
Civil responsibility	450,818	54,098	225,409	27,049
Cost of the contract	40,000	4,800	40,000	4,800
Appeal To A Third	50,000	5,000	25,000	2,5
Robbery	54,408	5,441	27,204	2,720
Fire	55,188	5,519	27,594	2,759
FGVAC		0,3		0,3

FPAC		0,5		0,5
FGA		1		1
Total	**727,071**	**727,071**	**386,836**	**386,836**
	Robbery		**Fire**	
Basic premium	25,668		25,668	
Rate	4,79%		4.92%	

Source: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ftusanet.org/wp-content/uploads/2015/10/Tarif-6.pdf

Table 10: Use of tourist taxi (+4 places) Vehicle value=8000D

New Pricing (2014)				
	Annual		**Semestrial**	
	Net	**Tax**	**Net**	**Tax**
Civil responsibility	547,421	65,691	273,74	32,845
Cost of the contract	40,000	4,800	40,000	4,800
Appeal To A Third	50,000	5,000	25,000	2,5
Robbery	63,988	6,399	31,994	3,199
Fire	65,028	6,503	32,514	3,251
FGVAC		0,3		0,3
FPAC		0,51		0,5
FGA		1		1
Total		**856,629**		**451,615**
	Robbery		**Fire**	
Basic premium	25,668		25,668	
Rate	4,79%		4.92%	

Source: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ftusanet.org/wp-content/uploads/2015/10/Tarif-6.pdf

Table 11: Use: Collective taxi Vehicule value =10000D

New Pricing (2014)				
	Annual		**Semestrial**	
	Net	**Tax**	**Net**	**Tax**
Civil responsibility	877,152	105,258	438,576	52,629
Cost of the contract	40,000	4,8	40,000	4,800
Appeal to a third	50,000	5,000	25,000	2,500
Robbery	79,102	7,910	39,551	3,955
Fire	82,9	8,290	41,451	4,145
FGVAC		0,3		0,3
FPAC		0,5		0,5
FGA		1		1
Total	**1262,214**	**1262,214**	**654,407**	**654,407**
	Robbery		**Fire**	
Basic premium	38,502		38.502	
Rate	%4.06		%4.44	

Source: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ftusanet.org/wp-content/uploads/2015/10/Tarif-6.pdf

Table 12: The pricing of the robbery guarantee

%	**2.62‰**	**2.36‰**	**1.75‰**
Pricing type	- Personal use: transport of goods for its account (truck <3.5 tons) --Agricultural use (truck >3.5 Ton), agricultural machinery, tractors and work machinery	Agricultural use (truck <3.5 Ton),	-Transportation of goods for personal use (truck>3.5 tons) -Transport of goods on behalf of a third party (truck>3.5 tons)

The amount	15000basic premium+2.62‰ of the market value of the vehicle	15000 basic premium + 2.36‰ of the market value of the vehicle	15000basic premium +1.75 ‰ of the market value of the vehicle

Source:FTUSA(https://www.ftusanet.org/wp-content/uploads/2016/02/%d9%85%d9%84%d8%ad%d9%82-%d8%b9%d8%af%d8%af4.pdf

Table 13: The pricing of the fire guarantee

%	2.79‰	3.06‰	4.37‰	5.68‰	6.29‰
- Type of pricing	- Agricultural use (truck<3.5Ton)	- Personal use	- Transport of goods for its account (truck <3.5Ton) -Agricultural use (truck >3.5 Ton), -Agricultural machinery, tractors and machines of work -Motorcycles	- Transport of goods for its account (truck>3.5Ton)	Transport of goods on behalf of third parties Trucks>3.5Ton)
Amount	10000 basic premium + 2.79‰ the market value of the vehicle	10000 basic premium+ 3.06‰ the market value of the vehicle	10000basic premium + 4.37‰ the market value of the vehicle	10000basic premium + 5.68‰ the market value of the vehicle	10000basic premium + 6.29‰ the market value of the vehicle

Source: https://www.ftusanet.org/tarifs/(https://www.ftusanet.org/wp-content/uploads/2016/02/%d9%85%d9%84%d8%ad%d9%82-%d8%b9%d8%af%d8%af4.pdf)

METHODOLOGY

The aims of the current study resonate with the qualitative research method, offering an immersive exploration of intricate phenomena to uncover the underlying dynamics of the technical profitability of the automobile insurance sector of Tunisia. Furthermore, the study's objectives align with the interpretivism philosophy, as Cuthbertson *et al.* (2020) highlight the significance of the interpretivist paradigm in comprehending individuals' perceptions, experiences, and contextual meanings. Through this lens, the research gains unparalleled insights into the intricate relationship between central to this endeavour is an inductive approach, which also aligns with the study scope, as the technical profitability of the Automobile insurance of the companies and its performance based on the S/P ratio (Robinson *et al.*, 2020). According to Place (2022), the qualitative method serves as a gateway to a nuanced comprehension of the intricate web of relationships within the research subject, delving into the subtleties that quantitative analyses may overlook. Furthermore, Toker *et al.* (2019) expand that the interpretivism philosophy embraces the richness of human experiences, shedding light on the multifaceted relationship between the sinister ratio and the premium paid by the companies, which will provide an effective illustration of the technical profitability of the automobile insurance sector of Tunisia. By embracing the unexpected, the inductive approach enhances the authenticity and robustness of findings, mirroring the dynamic and evolving nature of the subject under investigation, as highlighted by So *et al.* (2021). In the synthesis of these elements, the chosen methodology becomes a vehicle for in-depth exploration, alignment with the research objectives, and the unveiling of novel insights that enrich the academic discourse on the interplay between different guarantees and the profit earned by the automobile insurance companies in Tunisia (Asante *et al.*, 2023; Gagai, 2022; Zheng *et al.*, 2022).

Data Collection and Analysis

A diverse set of qualitative data from pertinent sources will be gathered during the data collection procedure. This may include of scholarly writings, documents outlining policy, and industry studies that have looked at the technical profitability using the S/P ratio calculation. It can be examined by figuring out Tunisia's S/P ratio for the automobile insurance sector.

RESULTS AND DISCUSSION

A combined ratio is used to evaluate the insurance markets in various nations and is used to analyze technical profitability (see equation 2). Financial analysts typically use it to assess the profitability of various firms' insurance divisions. A percentage of premium revenue is used to quantify the relative cost of insurance.

Combined Ratio= sinister rate + operating coefficient (1)

Sinister ratio=sinister expense /Net earned premiums (2)

Exploitation coefficient= exploitation expenses/net earned premiums (3)

The data from the years 2019 through 2021 have been taken from the official government website. In order to compute the combined ratio, we must first calculate the sinister rate and then the operating rate.

The Graphic Illustration and Interpretation

The combined ratio follows the same trend as the sinister ratio, as can be seen by looking at the table and graph below. We can see that the surplus in the vehicle branch is due to the fact that the sinister costs are lower than the earned premiums. In fact, the graph demonstrates that the ominous (sinister) ratio changes between 2019 and 2021, reaching its minimum in 2020 before tending to increase subsequently.

It should be noted that a combined ratio below 100% indicates a favourable outcome for the insurer's activities, while a ratio beyond 100% indicates a poor outcome from a technical standpoint. In our example, the combined ratio is above 100% in 2019 and 2021, indicating negative technical profitability, while it is below 100% in 2020. Due to the structural imbalance of the branch shown by this ratio, the business needs to make a sizable profit. We suggest analyzing the ratio by the type of assurance

Table 14: The combined ratio in percentage

	2019	2020	2021
Sinister expenses in MD	764,145	686,040	837,086
Net earned premium in MD	1 031,114	1 073,777	1 162,326
Sinister ratio	0,7411	0,6389	0,7202
Operating expense (management expense) in MD (3)	290,928	323,435	347,952
Operating coefficient	0,28214921	0,30121245	0,29935836
Combined ratio	1,02324921	0,94011245	1,01955836

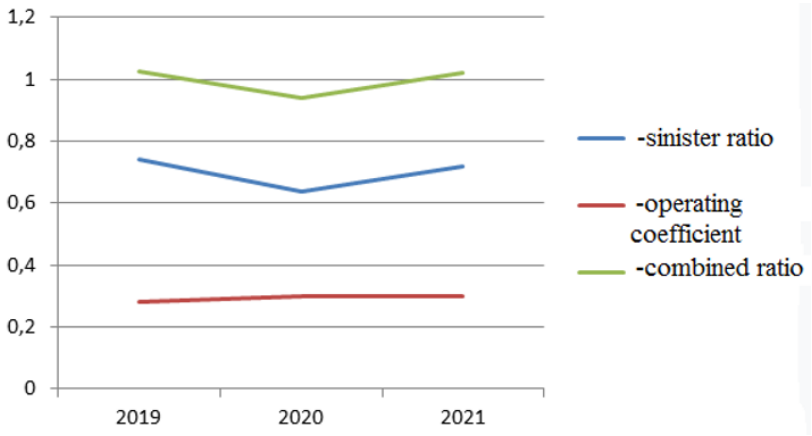

Figure 1: Curves of sinister ratio, operating coefficient and combined ratio

(optional vs. non-optional) in order to comprehend this deficiency. The sinister ratio is written as follows on the other side:

Ratio of sinistrality= sinistrality expense + operating expense (4)

However, the operating expenses only affect a little the combined ratio compared to the sinister expenses. Therefore, we will analyze the sinister-to-premium ratio S/P ratio, with S and P being the sum of sinister and the sum of optional and non-optional premiums, respectively. We notice:

S/P= optional sinister ratio(1-p) +non-optional sinister ratio**

$$S/P = (1-p)\frac{S_f}{P_f} + p\frac{S_{nf}}{P_{nf}} \quad (5)$$

S_f : Sinister related to the optional guarantees.
S_{nf} : Sinister related to the non-optional guarantees.
p_f : Sinister related to the optional guarantee.
p_{nf} : Premiums related to the non-optional guarantees.
S/P= optional sinister ratio*(1-p) +non-optional sinister ratio *p

$$S/P = (1-p)\frac{S_f}{P_f} + p\frac{S_{nf}}{P_{nf}}$$

$$p = \frac{P_{nf}}{P_{nf} + P_f}$$

$$1-p = \frac{P_{nf}}{P_{nf} + P_f}$$

If there is additional information about the various sorts of assurances, this equation enables us to comprehend the causes of the imbalance. The analysis of the operational performance of the car, transportation, and fire insurance is presented in Table 15 below. Before beginning the interpretation, keep in mind that the insurance company divides the cost of the compensated sinister (including administration costs) by the sum of the premiums received in order to determine the sinister-to-premium ratio (S/P). The ratio achieved must be smaller than 1 in order for the insurer's business to be profitable. Table 15 shows that the highest rates for vehicle insurance in MD were granted in the years 1067,214 in 2019, 1107,798

Table 15: Analysis and operating results of the automobile, transport and fire insurance

	Automobile Insurance			Transport Insurance			Fire Insurance		
	2019	**2020**	**2021**	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
Issued premium in MD	1067,214	1107,798	1199,738	84,658	75,752	88,69	135,40	145,82	161,82
The part of the premium in the total emissions	44,20 %	43,07 %	42,35 %	3,51 %	2,95%	3,13 %	5,61 %	5,67 %	5,71 %
Paid sinister in MD	737,152	634,499	714,312	26,718	13,804	28,170	90,253	107,160	103,53
Earned premium[5]	1031,114	1073,777	1162,326	81,755	77,754	86,49	137,37	145,20	154,58
Management fees in MD[6]	290,928	323,435	347,952	19,293	22,114	23,317	40,592	44,458	44,45
sinister to earned premium ratio in %	102,32	94,01	101,95	29,43	19,80	24,37	61,38	70,04	113,82
Technical results									
The subscription balance in MD	254,001	400,691	319,741	61,137	55,548	69,027	47,445	39,631	-20,981
Management fees in MD	290,928	323,435	347,952	19,293	22,114	23,318	40,598	44,457	44,457
The financial balance in MD	117,497	110,954	124,924	3,474	2,687	3,531	12,926	9,048	11,821
The reinsurance balance (result of cession) in MD	33,369	33,159	29,181	-25,780	-31,934	-40,077	-8,685	-5,686	64,961
The technical result of MD	47,200	155,051	67,533	19,538	4,187	9,164	11,087	9,907	11.344

Source: FTUSA 2021 report (Tunisian Federation of insurance companies)

in 2020, and 1199,738 in 2021. Transport insurance, however, has the lowest premiums (84,658 MD in 2019, 75,752 MD in 2020, and 88,69 MD in 2021). The greatest S/P ratio relates to automotive insurance by comparing the S/P ratios for the three categories of guarantees: automobile, fire, and transport. Around 100%, this ratio is almost constant. Due to the fact that the premiums collected are insufficient to cover the quantities of sinister, the S/P ratio for the whole car branch is seen as being extremely high. Despite the positive outcomes of the other guarantees, this issue is mostly caused by the civil responsibility guarantee's inefficiency, which exhibits an ineffectiveness of about 200% and severely affects the branch's profitability.

The S/P ratio for fire insurance increased from 61.38 in 2019 to 113.82 in 2021, indicating that it was not steady from 2019 to 2021. However, the S/P ratio for transport insurance is the lowest, falling from 29.43% in 2019 to 24.37% in 2021.

Table 16: The S/P ratio of the civil responsibility auto (2010-2012)

	2010	**2011**	**2012**
Premium	201	206	211
Total cost	357	413	419
Sinistrality rate	178%	200%	198%

Source: Reform of the automotive civil responsibility insurance in Tunisia: inventory and recommendations 2015

The analysis of the automobile's civil responsibility (RC) at this level of the industry shows a sinister Premiums (S/P) rate that is effectively well above 100% for the years 2010 to 2012. This underpricing is made all the more unfortunate by the fact that no business in the industry managed to generate a technical surplus in the Auto category between 2010 and 2012 (a technical surplus is one in which the S/P ratio is less than 100%). Table 16 shows that the civil liability insurance sinistrality rate is, on average, 192%. We conclude that the S/P ratio in 2011 demonstrated consistent growth within the context of the civil responsibility guarantee. In fact, it showed a comparatively high rate in 2011, which was 200%, compared to 178% in 2010. Even while the premiums paid under this guarantee have increased, they still need to cover the high levels of expenditure.

Challenges of Calculating the Equilibrium Rate of Civil Responsibility Insurance

As stated in Article 110 of the Insurance Code, civil responsibility ("RC") insurance for land motor vehicles has been required since 1960 (Bertolini & Riccaboni, 2021). Both the car owner and the insurers, who are obligated to provide insurance, are burdened by this responsibility. However, Bergkamp (2021) states that it must be acknowledged that the State's assessment of the civil liability risk needs to be revised. The public authority

(State) price will apply to this risk. This price is legitimate in two ways: (i) to safeguard customers' purchasing power who are compelled to purchase this insurance service at an excessive price.; (ii) to ensure the price is reasonable, to avoid potential dumping amongst businesses, to secure these businesses' solvency, and, as a result, to assure the insured's protection. Unfortunately, despite the fact that this dual obligation should force the State to exercise extreme restraint so that the price accurately reflects the true cost of the evil(sinister), the periodic adjustment of these prices has historically been flawed, leading to a glaring underpricing that had negative knock-on effects on the industry (Boyd, 2018). The General Committee of Insurance ("CGA") did not appear to be in a position to know the actual cost of the civil responsibility:

Table 17: Sinistrality (ratios S/P) as a function of uses

	2010	**2012**
TPV (taxis and similar)	127%	143%
Business and walks	166%	210%
Utility 1	199%	237%
Agricultural utility	314%	363%
Utility >3.5 Tonne	172%	203%
2 wheels	506%	937%

Source: Reform of the automotive civil responsibility insurance in Tunisia: inventory and recommendations 2015

For the majority of businesses, no accounting or statistical information differentiates civil responsibility from other automotive promises or guarantees. This made it impossible for the supervisory authority to determine the proper balance price for civil responsibility insurance. However, because of the asymmetry in this risk, all the insurers are dissatisfied with the outcome. Some of these insurers presented a sinistrality (more than 200%) that needed to be revised from a technical standpoint. The "agricultural utility" and "2-wheel use" offer dismal results, with corresponding S/P ratios of 363% and 937% in 2012. This is evident in light of the table for the investments made from 2010 to 2012. We also see that the sinistrality ratio is large and exceeds 100% for all purposes. No outcome can be considered average. This viewpoint allows us to conclude that the imbalance in the automobile industry is mostly caused by the "use of two wheels" and "agricultural utility." The S/P ratios for "taxis," "business and walks," and "utility > 3.5-tonne" usage in 2010 were, respectively, in the range of 127%, 166%, and 172%, which is less than but still greater than 100%.

CONCLUSION

In conclusion, the current study used a qualitative methodology based on the interpretivism school of thought to analyze the technical viability of the Tunisian car insurance market in great detail. This approach dives into complex phenomena and offers a detailed picture of the dynamics of the industry. The study uses an inductive methodology to unearth ideas that align with its goals. The combined ratio, with an emphasis on the S/P ratio equation, is used in the study to measure the profitability of insurance operations through data collecting and analysis. The results show that the vehicle insurance industry is facing difficulties, with S/P ratios that routinely surpass 100% and indicate low technical profitability.

The civil liability guarantee, especially for "agricultural utility" and "2-wheel use," greatly adds to this disparity. In order to ensure the sector's viability, the research emphasizes the necessity for pricing modifications and a deeper comprehension of its dynamics.

RECOMMENDATIONS

Addressing non-optional sinistrality rates is essential for enhancing the S/P ratio. This may be accomplished by enhancing traffic safety measures, lowering the number of insurance claims, and putting in place an efficient risk reduction technique. Furthermore, maintaining market profitability and fairness will result from readjusting premiums to represent risk profiles appropriately. Encouragement of optional coverage and package formulae, similar to popular designs like the GAT, among policyholders can raise overall premium levels. A more sustainable and effective insurance market in Tunisia can be achieved by adopting key principles from Morocco's insurance reform, such as increasing the basic civil responsibility premiums, lowering accident frequency through data-driven prevention, and lowering average claim costs through digitalization, compensation scale revisions, and alternative dispute resolution mechanisms.

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Appendix

[1]Ratios are calculated by the insurer in order to check the profitability of an insurance policy: it consists of calculating the ratio between the amount of sinister divided by the premiums (S/P) or contributions collected (S/C) under the same contract.

[2]Generally, an appeal is the fact of appealing to a third person or an institution to obtain recognition of a right that has been disregarded. Appealing can be amicable or contentious, and depending on the subject of the dispute, it can be civil or administrative.

[3]Management fees: acquisition fee and the other net

management expenses.

[4]The earned premiums correspond to the proportion of the issued premiums that have been earned during the accounting period. The issued premiums cover the period indicated in the insurance policy. The difference between issued premiums and earned premiums is a provisioned amount which is included in the reserves for unearned premiums. These amounts are treated as assets belonging to the assured.

[5](Acquisition costs + Other net management costs)