

Work Project, presented as part of the requirements for the Award of a Master Degree in
Finance from the NOVA – School of Business and Economics.

**„CFA Research Challenge – NOS Equity Valuation – A 5G Era Perspective; Enhancing
Equity Valuation through Monte Carlo Simulations”**

Jakub Zogata

Work project carried out under the supervision of:

Gonçalo Sommer Ribeiro

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Abstract

NOS SGPS, S.A. is one of the key players in the Portuguese Telecommunication Market and, on 06/11/23 its share price was trading at € 3.51. The paper aims to show that due to efficiency gains and a completed technology renewal cycle, its fair share price is € 4.18.

Individual part explores the enhancement of equity valuation through Monte Carlo simulation, emphasizing the critical aspects of selecting appropriate inputs, distributions, and correlations

Keywords

Corporate Finance, Valuation, Equity Research, Discounted Cash Flow, CFA Research Challenge

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Ticker NOS.LS
Company NOS SGPS S.A.

Recommendation **BUY**

Date	06.11.2023
Current Price	€ 3.51
Target Price	€ 4.18
Upside	19.07%
Industry	Telecommunications Services
Sector	Communications Services
Stock	Euronext Lisbon
Exchange	
Market Cap	€1.752bn

ROE (2023e)	15.27%
ROIC (2023e)	7.58%
Market Share Comm.	31.6%
Dividend Yield	7.92%



INVESTMENT SUMMARY

This research concludes on a **BUY** recommendation with a target price of € 4.18 representing an upside of 19.07% on the price at closing on the 6th of November 2023.

The recommendation is based on three main drivers: (1) Technology & CapEx Cycles (2) Leadership position in 5G technology with robust offers and high customer satisfaction (3) Resilient financial performance, shifting from growth targeting to cost efficiency, which will enable stable cash flow generation.

LEADERSHIP POSITION

The company profits from a diverse revenue mix, which is dominated by their main business: telecommunications. Forward looking management in form of strategic investments enabled NOS to place themselves as a technological leader in the market, which combined with high customer satisfaction and increased brand awareness, builds a strong fundament for the future. Maintaining close relationships with its customers will prove advantageous in a competitive market with a lot of price pressure. Moreover, in contrast to other players, NOS benefits from its legacy business "Audiovisuals", which is expected to contribute with a high ROIC to the overall value creation of the company. Additionally, NOS is prioritizing transformation to achieve greater efficiency through adjacent businesses, exemplified by the launching of "Alarme Inteligente" to diversify services, potentially tap into new income sources, and drive growth through synergies by utilizing existing infrastructure, distribution channels, and customer base.

FROM REVENUE TO MARGIN GROWTH

NOS is committed to digitalization, fostering superior customer services and operational efficiency. NOS already demonstrated this with their strong and resilient historical financial performance despite a challenging macro environment. The achieved cost reduction in the past are expected to continue leading to higher margins.

TECHNOLOGY & CAPEX CYCLES

The company has made significant investment in its 5G and fiber network, and with that securing a leading position with the highest spectrum allocation. With these investments, the management pursues its strategy to be at the forefront of new technologies in the telecommunication market in Portugal. We expect the already decreasing capital expenditures to stay at lower levels of around € 400mn per year until 2030e. Due to that we expect the Free Cash Flows to increase up to €336.6mn in 2029e. Whereby afterwards a new investment cycle for 6G networks is expected. With these investments in technology the company's management is making strong strategic decision to follow its vision.

	2022	2023e	2024e	2025e	2026e	2027e	2028e	2029e	2030e	2031e	2032e	2033e
Revenue (€, mn)	1,521	1,603	1,662	1,684	1,704	1,724	1,745	1,767	1,788	1,808	1,826	1,845
EBITDA Margins	42.80%	44.56%	43.61%	43.93%	44.00%	43.92%	43.84%	43.75%	43.66%	43.57%	43.49%	43.40%
CapEx/ Revenue	41.14%	29.64%	24.86%	23.18%	22.63%	22.45%	22.40%	22.38%	26.61%	29.92%	32.32%	34.01%
Net Income (€, k)	224,445	147,986	162,633	193,175	211,761	225,101	236,176	246,546	252,213	244,995	231,752	217,945
EPS (€)	0.44	0.29	0.32	0.38	0.41	0.44	0.46	0.48	0.49	0.48	0.45	0.43
DPS (€)	0.43	0.28	0.29	0.34	0.38	0.40	0.40	0.40	0.40	0.40	0.29	-

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Figure 1: NOS

Source: (NOS SGPS, S.A 2023)

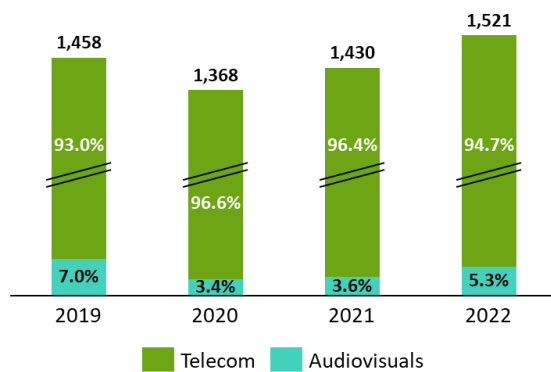


Figure 2: NOS Segments Revenue [€, mn]

Source: (NOS SGPS, S.A 2023)

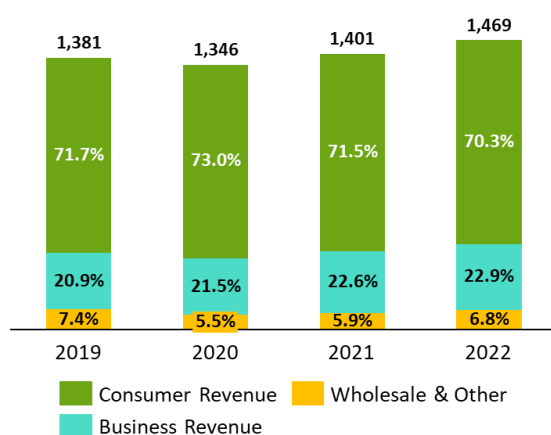


Figure 3: NOS Telco Brutto Revenue Split [€, mn]

Source: (NOS SGPS, S.A 2023)

1 Business Description

NOS SGPS SA is a Portugal-based company that resulted from the merger between Zon Multimédia, a leading TV operator, and Optimus Telecomunicações, a small telecommunications provider in 2013. The company's shares are listed on the Euronext Lisbon stock exchange. The vision of the company is to “Be the driver of the transformation of Portugal into a better society, in which everything and everyone will be connected to everything and everybody in extraordinary ways.” The mission of NOS is to foster interconnectedness among individuals, companies, and organizations while leveraging innovation and new technologies to provide the best possible experience. NOS's ultimate objective is to create value for society while transforming the present. The company operates in two segments – telecommunications and media and entertainment, with the latter being further divided into the distribution of audiovisual content (“NOS Audiovisuals”) and cinema projections (“NOS Cinema”), offering video production and sale, cinema exhibition and distribution, acquisition and negotiation of Pay TV and VOD (video-on-demand) rights. NOS also holds stakes in three joint ventures: 50% in Dreamia, 30% in Zap and 25% in Sport TV. The company positioned itself as a prominent player holding a comprehensive service offering through residential and Private (B2C), Corporate (B2B), and Wholesale (B2B) customer segments. Its forward-looking strategy, as well as a marked commitment to innovation and cutting-edge fiber network, ensure a leading position of NOS in the years to come. The firm offers a wide array of services, voice, and internet access services, including fixed and mobile solutions, television (cable and satellite), Internet of Things (IoT) services including cloud, ICT as well as offers from adjacent businesses – advertising on Pay TV channels, Insurance, and Alarms.¹ In addition, NOS offers data center management and IT consulting services. The telecommunications business segment represents the higher share of revenue, representing 94.5% of the total revenues of € 1,469mn in 2022. Whereas the entertainment business segment did reach € 80mn in revenue in 2022.

1.1 Telecommunications

According to the 2022 annual report, sales in the consumer segment rose by 3.1% this year compared to 2021, with an increase in the number of customers and revenue from the sale of terminal equipment explaining most of the

¹ The abbreviation IoT refers to a network with physical presence such as devices equipped with network connectivity that allows them to collect and share data. As in NOS's example, to enhance customer experience. Source: (IBM 2023)

Group Part

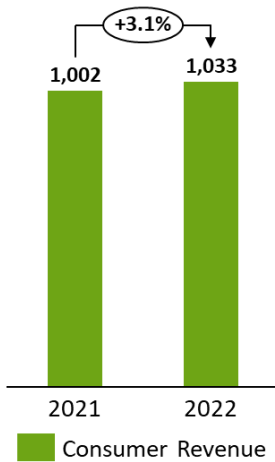


Figure 4: Consumer Segment Revenue YoY Change [€, mn]

Source: (NOS SGPS, S.A 2023)

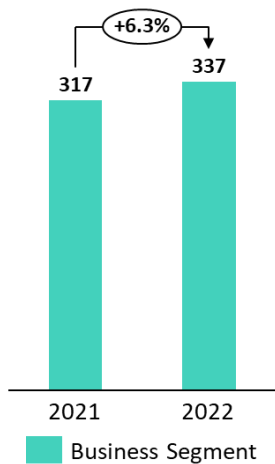


Figure 5: Business Segment Revenue YoY Change [€, mn]

Source: (NOS SGPS, S.A 2023)

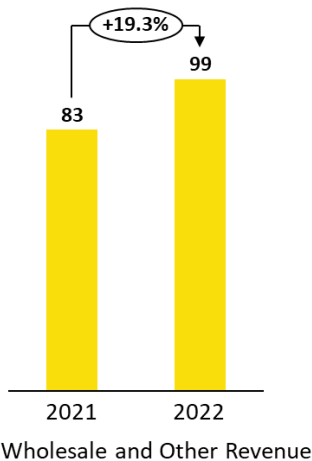


Figure 6: Wholesale and Other Revenue YoY Change [€, mn]

Source: (NOS SGPS, S.A 2023)

evolution. Revenues in the corporate segment increased by 6.3% to € 336.5mn, driven by the 4.6% growth in customer revenues. Adjusting for revenues from integrated IT consulting projects, which typically entail a reduced margin, revenues from this business segment grew 3.7%, as per the above-mentioned report. The remaining telecommunications revenues, coming from “Wholesale and Others”, are composed of devices, equipped with network connectivity and allowing for data collection and data sharing. This segment which represents less than 10% of revenues, grew by 19.7% to € 99.3mn, driven by operator, roaming, and value-added call revenues.²

For the first nine months of 2023, Telco revenue has been mainly driven by the B2C segment, with fixed bundled offers continuing to be preferred by customers, with 12.2 thousand Net Adds to 1,126.2 thousand customers in 2023/Q3, representing 69% of the fixed customer base. The consumer segment revenues have increased by 6.6%. On the other hand, B2B revenue has risen by 0.6% and Wholesale and other revenues by 4.0% yoy, due to the recovery of roaming revenues. Telco revenue has increased 3.9% yoy, reaching € 1,131.6mn. NOS has a leading position in post-paid mobile, representing the highest percentage of the mobile subsegment overall, attributed to its dominant 5G mobile network development.³

Moreover, NOS has a well-established presence in pay TV and fixed broadband as the ‘close number 2 operator” in Portugal in terms of revenue and subscribers.⁴ As of 2023/Q3, the company has a well-developed fixed network with fiber-to-the-home (FttH) penetration of almost 70.4% of total homes passed (including both FttH only and FttH + HFC), equivalent to 3.8mn homes out of 5.4mn in total. There is a clear trend of “homes passed” being switched to FttH, as compared to HFC only. For the upcoming periods, NOS will aim to expand its footprint to 5.4mn homes and reach 100% FttH penetration, achieved by shared agreements, further network expansion as well as wholesale. As of 2023/9M, RGUs grew by 202.5k to 10.985mn, with 161.7 thousand mobile net adds, 5.4k in Pay TV, 11.2 thousand in fixed voice, and 23.1 thousand in broadband.⁵ ⁶NOS can support higher fixed average revenue per user (ARPU) than the competitors, recognized due to its network,

² (NOS SGPS, S.A 2023)

³ (NOS SGPS, S.A 2023)

⁴ (S&P Global 2023)

⁵ (NOS SGPS S.A 2023)

⁶ (NOS SGPS, S.A 2023)

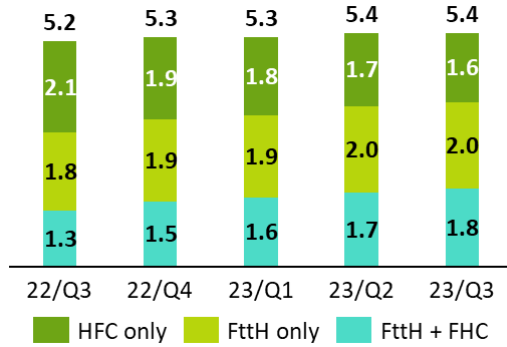


Figure 7: Fixed Network Evolution per Technology [mn]

Source: (NOS SGPS S.A 2023)

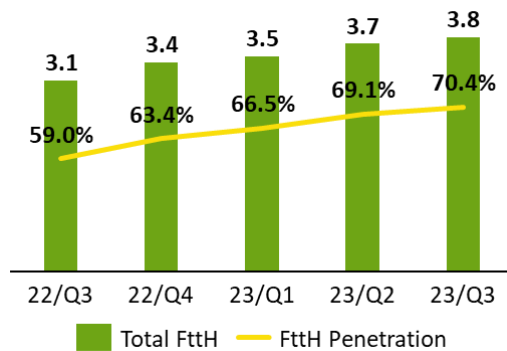


Figure 8: FttH Homes Passed [mn] | FttH as % of Total Homes Passed

Source: (NOS SGPS S.A 2023)

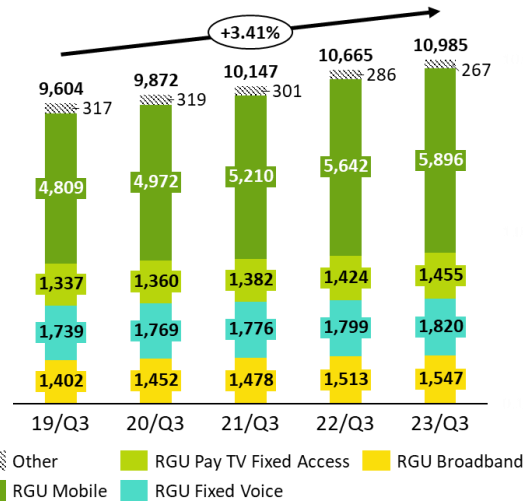


Figure 9: RGU per Sub-Segment [k]

Source: (NOS SGPS, S.A 2023)

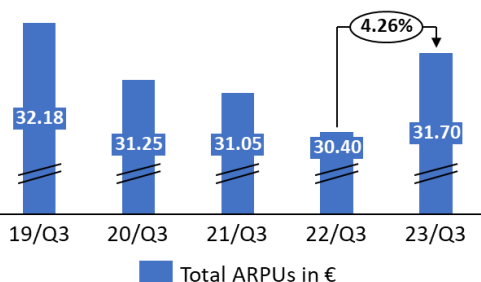


Figure 10: Evolution of NOS ARPUs per quarter [€]

Source: (NOS SGPS, S.A 2023)

competitive content offering, and flexible “pick & mix” tariff plan.⁷ Through the period from 2019 to 2023, a gradual increase in RGUs can be observed, with the majority coming from the mobile subsegment. ARPUs have been maintained consistently since the end of 2020 at approximately € 31, attributable mainly to the take-up in convergent offers. Growth in NOS’s revenue is expected to be driven by sustained demand for postpaid mobile and broadband, a high margin of convergent bundles as well and recovery in roaming revenue. Additional growth could be expected by adding new solutions such as cybersecurity, and remote assistance to its bundles.⁸

1.2 Media & Entertainment

“NOS Cinemas” holds the top position in Portugal for cinema exhibitions, featuring various projection technologies such as IMAX, 4DX, XVision, and ATMOS as well as exhibitions of alternative content screenings in cinema venues (opera, ballet, theatre, football, and other types of events). As of 2022, NOS has 214 screens in 30 cinemas in Portugal, and 39,933 seats overall, proving it to be the leader on the market with by far the most screens and seats, with a market share in terms of screens of 37.6%. For the year, NOS Lusomundo Cinemas had approximately 6mn admissions (tickets sold) out of 9.6mn in Portugal and 266,319 screenings out of 509,806 for the year, generating almost € 38mn Gross Box Office (GBO) out of total € 55mn. Overall, for the period from 2018 to 2022, NOS’s Audiovisuals market share in terms of admissions has grown from 60.1% in 2018 to 65.1% in 2022. The upturn since 2021, signifying a continuous rebound from the pandemic, serves as a testament that demand for cinema is likely to sustain as long as there are blockbusters depicted in cinemas, as per NOS’s report. The audiovisual segment of NOS has witnessed an increase of 53.8% compared to 2021, reaching € 80mn revenues in 2022. 2023/Q3 affirms the strongest performance of tickets sold reaching 2.8mn, surpassing pre-pandemic levels and representing a 57.4% increase in ticket sales compared to 2022/Q3. As of 2023/9M ticket sales have surged notably, increasing 45.2% yoy to 6.3mn for 2023/9M. The positive trend can be explained by the release of blockbusters, such as “Oppenheimer” or “Barbie. Furthermore, NOS is the leading distributor of audiovisual content in Portugal. The company acquires exhibition rights and distributes films and series from independent producers and studios in cinemas, audiovisual platforms, and television.⁹

⁷ (S&P Global 2023)⁸ (S&P Global 2023)⁹ (Portuguese Film and Audiovisual Institute 2023)

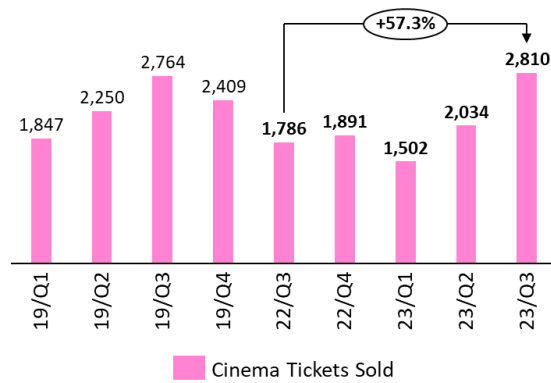


Figure 11: Cinema Tickets Sold [k]

Source: (NOS SGPS S.A 2023)



Figure 12: Growth Strategy Pillars

Source: (NOS SGPS, S.A 2023)

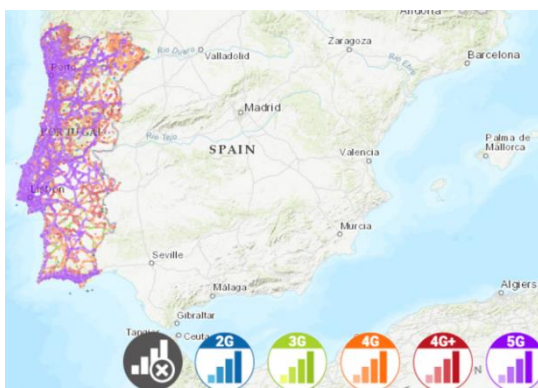


Figure 13: NOS Mobile Mainland Portugal Coverage Map

Source: (nPerf 2023)

1.3 Adjacent businesses

“NOS Alarme Inteligente”, a partnership with Securitas Portugal has been launched in 2022 as a security service to be associated with fixed and mobile communications as well as entertainment offers. The telecommunication firm will cover the whole product operations from installation to billing. “Playce” on the other hand, will target advertising activity that will be implemented on TV services such as Pay-TV or set-top-box. As of the end of 2022, more than 150 advertisers subscribed to the services that will consist of video shown before audiovisual content of those mentioned TV services.¹⁰

1.4 Growth Strategy 2021-2025

Following NOS Annual Report for the year 2022, NOS's overarching growth strategy 2021-2025 is based on six foundational pillars, aimed at creating value, developing the company as well as sustaining its preeminent position within the Portuguese market and further expanding its market influence.

1.4.1 5G Leadership

One of NOS's main objectives is to remain committed leading in 5G network infrastructure, which is currently the most advanced in Portugal. Given NOS's prompt response to the new market trends and technological cycle, represented by 5G, the company currently finds itself in a phase where further substantial infrastructure investments are no longer required for the upcoming years. As a consequence of that, the situation positions NOS favorably to generate higher free cash flows in the upcoming years, while key competitors would likely increase further their investments to develop infrastructure. In 2021, NOS has won the highest amount of spectrum, which allows the company to not only cement itself as a 5G leader in Portugal, but also to be able to provide 5G to the Portuguese population, including all customer segments. The company has received wide recognition for speed, coverage, and quality in 2022 from Ookla, Open Signal, DECO, and others. For instance, in July 2023, NOS received the “Mobile Experience Award” by OpenSignal, attesting to the high quality of its services and products (Appendix 1).¹¹ As of August 2023, the total number of 5G stations installed is 7,831, with NOS being the operator with the highest number of 5G stations, among competitors with 3,725. A 5G base station is defined as a radio station with at least one transmission equipment using 5G mobile technology and located in a given

¹⁰ (NOS SGPS, S.A 2023)

¹¹ (NOS SGPS, S.A 2023)

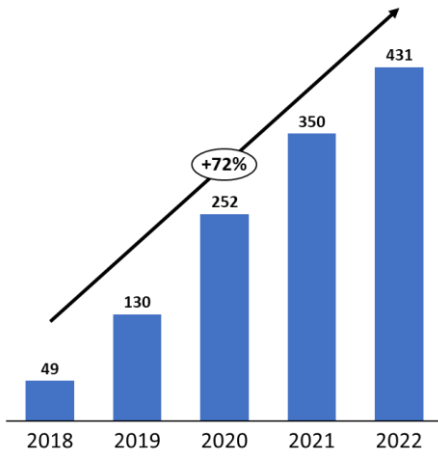


Figure 14: Number of Automated Processes

Source: (NOS SGPS, S.A 2023)

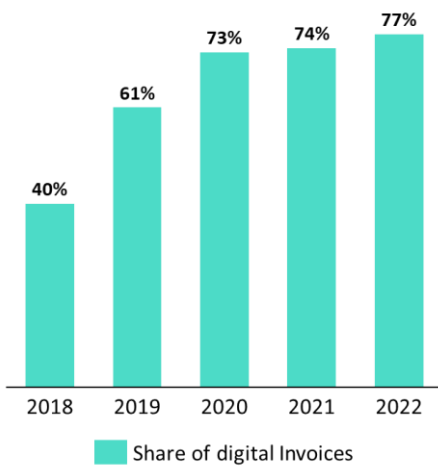


Figure 15: Digital Invoice Penetration [% of Customers.]

Source: (NOS SGPS, S.A 2023)

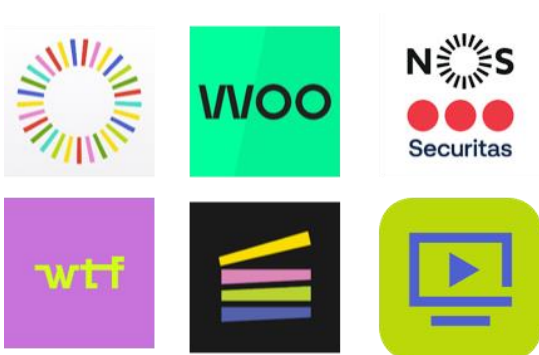


Figure 16: NOS Apps

Source: (NOS SGPS, S.A 2023)

geographical location. The number of 5G base stations installed in Portugal increased by 12% in the 2nd quarter of 2023.¹² According to the latest quarterly results, NOS has achieved a 5G coverage of 91% of the population.¹³ As of the end of 2022, according to the annual report, the company covered 5,284mn homes with new-generation Gigabit networks, achieved population coverage of 99% with 4G, and over 87% with 5G, capturing a substantial market share in integrated and convergent subscribers. The effectiveness of these bundled services is likely to allow NOS to foster a marginal increase in customer base by enhanced competitive appeal, enabled by their advanced network infrastructure, and high product and service quality. In addition, NOS focuses on technological advancement and innovation through its 5G dedicated fund, which invests in 5G-driven startups/projects, including an autonomous shuttle using 5G technology and providing advanced connectivity to enable remote surgeries. NOS benefits from several partnerships and services from providers regarding their IoT offers and cloud services.¹⁴

1.4.2 Digital Emancipation

Digital development is the opportunity to continually enhance customer experience and move closer to a customer-centric approach. NOS's commitment to digital transformation has been intensified, with digital channels playing a central role. According to the annual report 2022, this strategic priority has been reinforced by the implementation of advanced analytics solutions, leading to notable enhancements in the customer experience. NOS has further expanded the capabilities and usage of its digital ecosystem, resulting in a count of 1,122k digital users.¹⁵ Since 2019 more than 60 new digital features have been integrated into NOS's apps (NOS Apps+, WTF app, NOS Cinema App). Moreover, the total number of digital users has increased by 8.4x from 2018 to 2022. The importance of digital sales has increased since 2020, with a 6% increase in the weighting of digital sales of the fixed offer in the sales mix. Furthermore, "digital emancipation" will enable NOS to achieve higher efficiency gains through cost-cutting, specifically in supplies & external services and support services, through a reduction in repeat service calls and therefore a reduction in call center costs, as NOS's apps continue being developed to be easy to use and effective in solving client

¹² (ANACOM 2023)

¹³ (NOS SGPS, S.A 2022)

¹⁴ (NOS SGPS, S.A 2023)

¹⁵ (NOS SGPS, S.A 2023)



Figure 17: Product of the year in category TV experience.

Source: (Produto do Ano 2023)

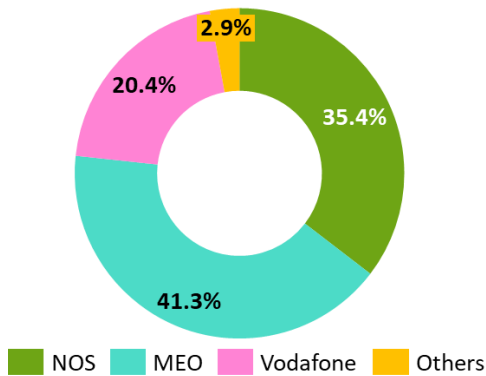


Figure 18: Market Share Bundles Subscribers [%]

Source: (NOS SGPS, S.A 2023)



Figure 19: NOS Alarme Inteligente Mobile App

Source: (NOS SGPS, SA 2023)

queries. The company is scaling AI Usage and Real-Time Customization, with dozens of Advanced Analytics use cases already deployed, leverages on automated chat interfaces and relies on human interaction only “as a last resort”. Overall, efficiency gains will be enabled through further automation of processes and increased digital accessibility. NOS aims to enhance omnichannel interactions and improve customer experience. An example is the digital invoices, offered to approximately 77% of customers, representing a 37pp growth in 4 years.¹⁶ Efficiency gains are going to be a vital part of strengthening NOS’s position for the years to come.¹⁷

1.4.3 Enhance Competitive Edge

NOS remains steadfast in its efforts to deliver exceptional connectivity services and maintain its offerings competitive by evolving its entertainment ecosystem, and consistently presenting competitive solutions tailored to its diverse customer segments. The company has the second largest market share in terms of subscriptions to bundled services out of a total of 4.6mn, which combined with the low churn rate of customers, signifies the competitive offerings of NOS, complemented by their good customer service.¹⁸ Moreover, notable improvements in 2022 include an enhanced Wi-Fi experience through the renovation of its routers and set-top boxes to next generation equipment (GiGA Routers), which leverage Wi-Fi6, speed up to 1Gb, allowing 4k Streaming and advanced gaming experience. Furthermore, NOS aims to offer the best customer experience via NOS TV, with up to 180 channels, and provide the UMA experience in any platform with more content delivery network capacity and multiple platforms, as well as pioneering the introduction of Disney+ on the UMA TV platform. Driven by the goal to enhance the experience of consumers, NOS started offering insurance for used smartphones, in addition to travel and new smartphone insurance in 2021. Customers can manage their insurance digitally through the NOS App.

1.4.4 Close Relationship

To thrive in the competitive telecommunications sector, NOS is dedicated to forging a deeper, more personalized connection with its customers. This commitment involves introducing innovative elements in product offerings and enhancing the overall customer experience to solidify NOS as a leading brand. Related to their strategy execution, NOS has increased its brand awareness

¹⁶ (NOS SGPS, S.A 2023)

¹⁷ (NOS SGPS, S.A 2023)

¹⁸ (S&P Global 2023)



Figure 20: NOS awarded for the third consecutive year as best mobile operator by Deco Pro Teste.

Source: (NOS SGPS, SA 2023)

by +7pp compared to 2021 to 34%.¹⁹ Moreover, after customer surveys conducted in 2023 by ESCOLHA do Consumidor, NOS has won consumer choice awards for preferred mobile network (79.5% score), TV Experience (75.6%), and Internet (75.2%).²⁰ According to Eleito Produto do Ano 2022, NOS has been awarded in four categories for which it applied – most advanced mobile network, Wi-Fi Signal Amplifiers, App TV Category, Android TV Box. Overall, maintaining close relationships with customers will prove advantageous in a competitive market with a lot of price pressure.

1.4.5 Value

NOS is focused on transformation to optimize efficiency and explore new business opportunities that leverage existing assets by exploring potential synergies and ultimately driving sustained growth. To exemplify its commitment to this pillar, in 2022, NOS has launched a new line of alarms – “Alarme Inteligente”. By diversifying its services, NOS can tap into new sources of income. By exploring synergies through adjacent businesses, NOS could further utilize its infrastructure, distribution channels, or customer base for the new offerings, and thus minimize additional costs associated with market entry.²¹

1.4.6 Focus on People

NOS has received recognition as a benchmark in ESG, which is described in more detail in chapter 4 (ESG). In 2022, NOS received the “Best Contact Centers 2022” award by APCC Portuguese Association of Contact Centers as well as the “Top of Mind Call Center Trophies” recognition, exemplifying the company's commitment to efficient management of human capital as well as excellent customer service. In terms of employees, as part of the goals from the strategic plan, in 2022, NOS has managed to improve the employee satisfaction index and committed to increase the number of women in management positions by 2025. The company is committed to being the best company to work for, as they realize their employees are a most valuable asset.²²



Figure 21: Award Best Contact Centers 2022 APCC Portuguese Association of Contact Centers

Source: (APCC Portuguese Association of Contact Centers 2023)

¹⁹ (NOS SGPS, S.A 2023)

²⁰ (Escolhar 2023)

²¹ (NOS SGPS, S.A 2023)

²² (NOS SGPS, S.A 2023)

1.5 SWOT

STRENGTHS • 5G Leadership. NOS has the highest number of 5G stations and 5G network quality, winning multiple awards • High quality services leads to a high customer retention and enables NOS to successfully implement price increases • Decrease in CAPEX in the short and medium term should translate to higher Cash Flows • Showing very resilient earnings performances since the pandemic, with increasing profitability • Successful implementation of cost efficiency plan due to new digital services (integration of new features into NOS's APP), which has led to increased margins despite an inflationary environment • PT leading role in Europe in terms of connectivity and coverage with 91% of PT households covered with next generation networks, with 85% of households covered with fiber • High penetration for TV service subscription of 95,7%, while for fixed broadband the figure reached 90/100 households (ANACOM, 2022)	WEAKNESSES • High dependence on the Portuguese market • Strong competitors (MEO and Vodafone) offering similar products/services to limited customer base • Portuguese Telecommunication market is highly saturated, leaving little room for growth in terms of market share • NOS faces high debt levels with a Net Debt/EBITDA ratio of 2.64x, limited cash reserves, and an average cost of debt that increased to 3.3% in 2Q23 due to bond refinancing, reflecting concerns in a rising interest rate environment.
OPPORTUNITIES • Driving digital innovation through partnerships and alliances: • Expanding to other new revenue streams through digital services like cyber security, IoT, Cloud, and Data services. Those services can be added on top of bundles or used separately • International expansion • Altice is accused of financial fraud, tax fraud, and money laundering. The scandal could lead to Altice customers losing confidence in the company and switching to competitors such as NOS. • The company can develop digitalization on some streams of cost that might enable better EBITDA margins.	THREATS • Arrival of the new entrant Digi is expected in the next 6-9 months which could upset the calm Portuguese Telecommunication market and implies a downside risk in terms of market share • Vodafone Acquisition of NOWO • Projected slowdown of growth in economic activity • Regulatory changes, for instance changes in pricing controls, spectrum allocation or enforcement of anew law on wages, which all could impact their income • Handling of sensitive data makes NOS vulnerable to cybersecurity threats which could lead to reputation damage • Unethical management behavior which could lead to reputational damage such as the links to Luanda Leaks • The firm might faces challenges on their debt levels for the new CAPEX cycle in around ten years when investing in 6G. • Increased costs driven by factors such as Inflation and energy prices

Figure 22: SWOT-Analysis

Source: Group Analysis

2 Macro Overview

The focus in 2023 at a macroeconomic level, was still on combating inflation, which rose sharply in 2022. Pivotal to this were supply-chain pressures caused by China's zero-covid policy during the pandemic, followed by the effects of the Russia-Ukraine war in terms of higher energy and food prices. Inflation in Portugal peaked at 10.14% (yoy) in October 2022. To combat inflation, the European Central Bank (ECB) raised interest rates from 0.50% to 4.50% over the period from July 2022 to September 2023. In the last meeting in October 2023 the ECB decided against a further rate hike for the first time in its quantitative tightening cycle²³. The impact of the interest rate hikes on the Portuguese economy became mainly apparent in 2023.

Economic expansion in Portugal slowed from robust GDP growth of 1.47% (qoq) in 2023/Q1 to a modest 0.14% in 2023/Q2 and now to a contraction of -0.20% in 2023/Q3. This was the first economic contraction since 2021/Q1. The slowdown is mainly due to the decline in the foreign sector. Interestingly, domestic private consumption and domestic investment picked up in 2023/Q3. On an annualized basis, GDP growth is expected to be 2.20% in 2023, 1.30% in 2024 and 1.80% in 2025²⁴.

Another challenge in the near future is the persistent inflation for Portugal, although it returned to a reasonable 2.12% in October 2023. This was especially due to the decrease in energy prices. Ideally, the inflation rate should be maintained at this level, even if strong wage growth puts pressure on service prices. On an annual average, inflation is likely to slow from 5.50% in 2023 to 3.20% in 2024 and 2.40% in 2025, which is broadly in line with the eurozone average. An inflation rate of 2.00% is expected in the medium and long term. Due to inflation, NOS was confronted with higher costs, particularly in connection with energy prices, prices for telecommunications equipment, wages, and external services. However, NOS was able to counteract and eliminate the increased cost pressure through energy contracts and efficiency gains on the operational side. At the same time, NOS and other competitors in the telecommunications sector were able to implement price increases based on inflation. It is important to emphasize that this has only been possible in recent years as, according to NOS, there has been less price competition in the market. While the outlook for economic growth appears subdued, there are also positive economic indicators that show a certain resilience. For

²³ (ECB 2023)

²⁴ (ECB 2023)

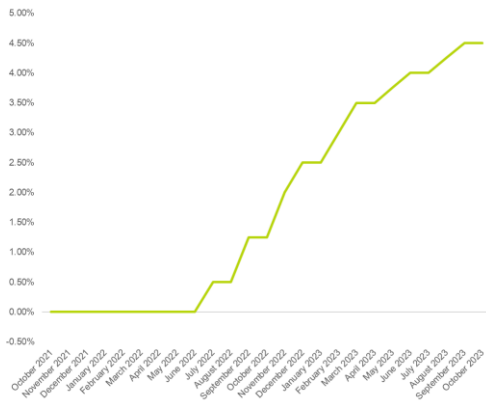


Figure 23: ECB Main Refinancing Rate October 2021 – October 2023 [%]

Source: (ECB 2023)

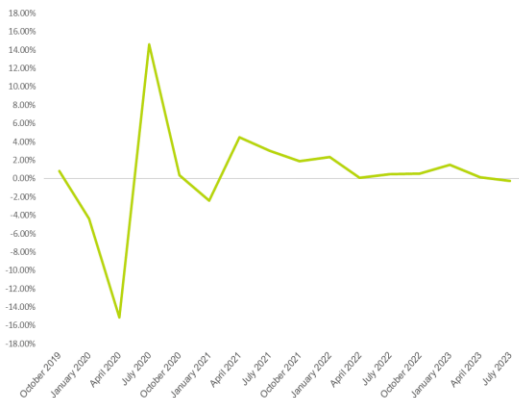


Figure 24: Portugal quarterly GDP Growth previous period October 2019 - July 2023 [%]

Source: (FRED Economic Data 2023)

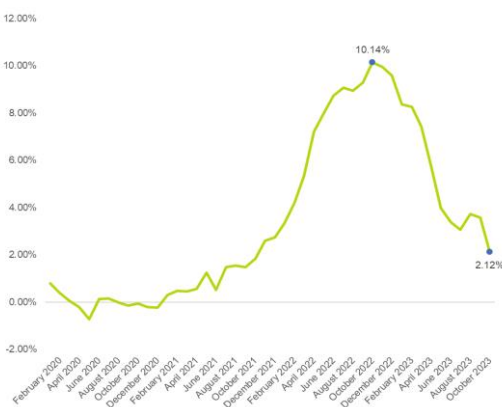


Figure 25: Monthly Inflation YoY Portugal February 2020 –October 2023 [%]

Source: (Statistics Portugal 2023)

example, positive employment growth and record-high employment rates were recorded in 2023. In addition, the increase in household income, the gradual recovery in global trade volumes and the implementation of the Recovery and Resilience Plan (RRP) should gradually improve economic performance in the future. This should maintain or even increase demand for telecommunications services. NOS has proven to be extremely resilient in this challenging macroeconomic environment and was able to increase its revenue and profitability through targeted strategic initiatives.

3 Industry Overview & Competitive Landscape

3.1 Telecommunications Industry Dynamics

3.1.1 Telecommunications Industry Portugal

The Portuguese telecommunications market can be split into two broad categories – wireless and fixed. Wireless includes mobile and PayTV DTH, while fixed includes Fixed Voice, both circuit-switched and Voice over IP (VOIP) as well as broadband. Overall, the Portuguese telecommunication market in 2022 has reached a market value of \$ 4.4bn, which corresponds to a CAGR of 3.40% from 2017 to 2022. Market consumption volume has been increasing with a CAGR of 2.20% between the same period, equivalent to 27.6mn total subscriptions in 2022. The subscriptions are expected to reach 28.8mn by 2027, which would equal a CAGR of 0.80% between 2022 to 2027. The market is expected to grow further and expected to reach a market value of \$ 4.6bn in 2027, which would equal a CAGR of 1.00%.

Furthermore, throughout the studied period the wireless segment has been consistently more significant than the fixed, representing 56.3% of the total market in 2022, whereby this significance is expected to increase in the future. This growth until 2022 has been mainly attributed to an expected increase in mobile penetration as well as demand for mobile data services, technological advancement, and faster connectivity enabled due to the well-established infrastructure and new developments driven by ANACOM, 5G-related product growth, IoT growth.²⁵ To understand more in-depth, the drivers of the telecommunications market, the four main categories can be further split by Mobile (pre- and post-paid), Pay TV (DHS and cable), Fixed Voice (Circuit and VoIP), and Broadband (fixed and mobile).

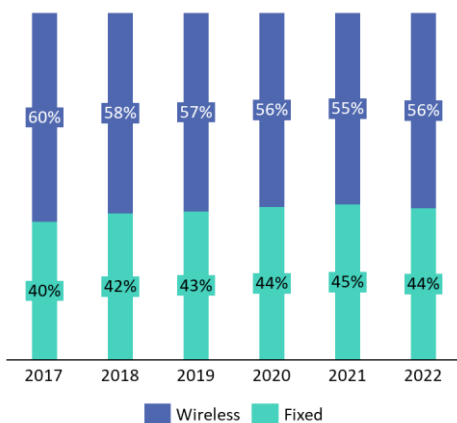


Figure 26: Portugal telecommunication services market category segmentation by value 2017-2022 [%]
Source: (GlobalData 2023)

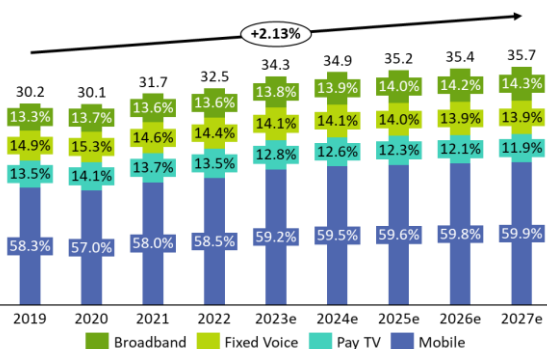


Figure 27: Portugal Telecommunication Sub-Segments Subscriptions Forecast [mn]
Source: (GlobalData 2023)

²⁵ (GlobalData 2023)

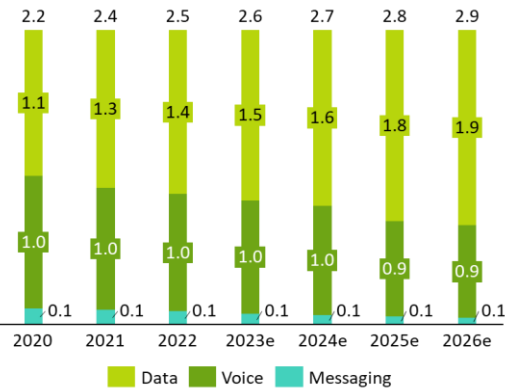


Figure 28: Total Mobile Revenue by Service Category [\$ bn]

Source: (GlobalData 2022)

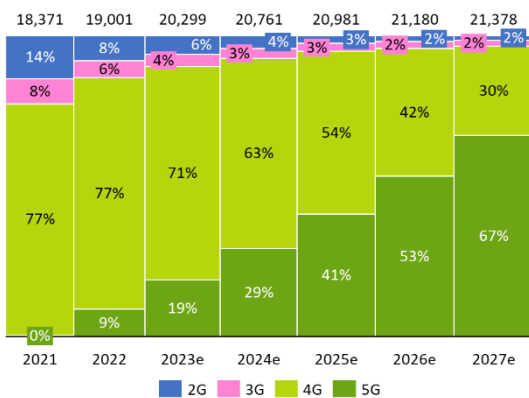


Figure 29: Mobile Subscriptions per Technology Generation [k]

Source: (GlobalData 2023)

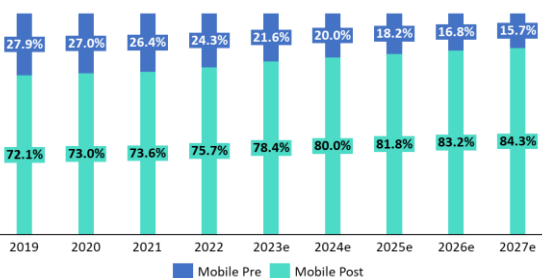


Figure 30: Mobile Post/ Pre-Paid Subscriptions Split Forecast [%]

Source: (GlobalData 2023)

3.1.1.1 Mobile

The total mobile segment is forecasted to increase by a CAGR of 2.96% from 2022 to 2027 to \$ 2.4bn. Total mobile subscriptions are expected to grow by a CAGR of 2.39% from 2022 to 2027, reaching around 21.3mn subscriptions, with a forecasted penetration rate as % of the population of almost 209.2%, reflecting the increase in demand as discussed above. This penetration rate can be explained by customers who might have two or three SIM cards (e.g. work and private phone). In terms of technology adoption trends, from the total mobile subscriptions, 5G is expected to continue being the predominant technology used, from 18.7% in 2023 to 66.9% in 2027.²⁶ According to market analyses, trends and the assumption that a technological renewal cycle lasts around ten years, the landscape will inevitably change again due to technological progress, which is currently forecast for 2030. Post-paid packages constitute the prevailing majority among mobile subscriptions. These subscriptions are forecasted to reach 84% out of the total mobile subscription in 2027. This projected trajectory is attributed, in part, to users' preferences towards bundled offerings, particularly the promotion of post-paid services. From a corporate standpoint, integrated offerings prove to be the most lucrative, taking into consideration market saturation and the relatively limited avenues for competitors to distinguish themselves due to the high similarity of products offered. The predominant source of revenue within the mobile subsegment is derived from the expansion of mobile internet subscriptions, followed by a proportion stemming from voice services and a far less significant contribution from messaging. While both "Voice" (\$1.0bn in 2023 to \$0.9bn in 2026) and "Messaging" (\$0.09bn in 2023 to \$0.06bn in 2026) are expected to decrease, "Data" is expected to offset those developments, leading the overall market to increase, and grow from \$1.5bn to \$1.9bn in the same period, equaling a CAGR of 8.20%.²⁷

3.1.1.2 Pay TV

According to Global Data Telecommunications revenue forecast for Pay TV, this segment will decline by a CAGR of -1.84% from 2022 to 2027, explained by a decline in cable-TV subscriptions due to higher adoption of OTT platforms such as Netflix.²⁸ During the mentioned period, the main growth in TV is forecasted to come from IPTV with a CAGR of 2% from 2021-2026, which is assumed to be driven by the expansion of fixed broadband services by

²⁶ (GlobalData 2023)

²⁷ (GlobalData 2022)

²⁸ (GlobalData 2023)

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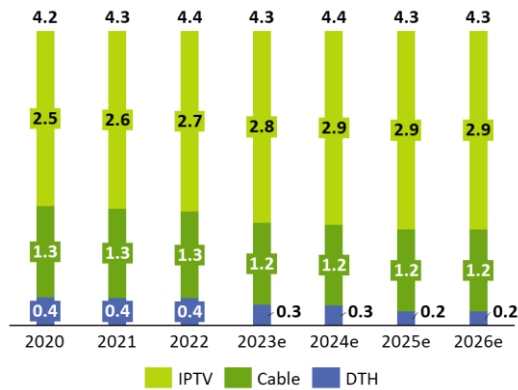


Figure 31: Total Pay-TV Subscriptions by Type [mn]

Source: (GlobalData 2023)

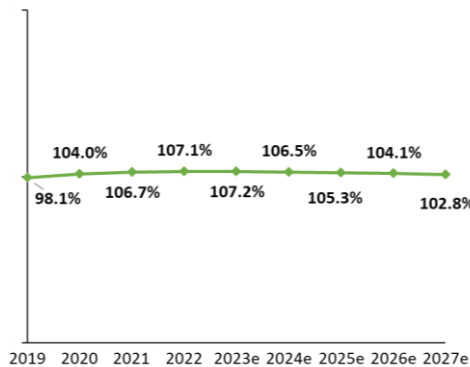


Figure 32: Pay-TV Penetration Rate [% of HH]

Source: (GlobalData 2023)

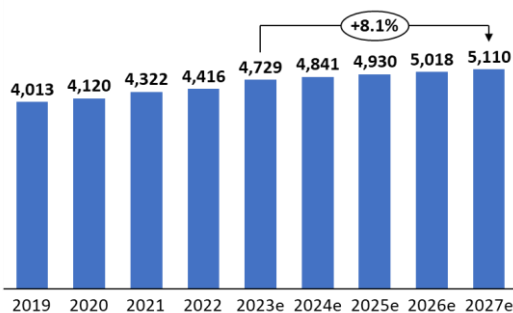


Figure 33: Total Broadband Subscriptions [k]

Source: (GlobalData 2023)

operators, especially fiber broadband services and rising adoption of multiplay bundles with pay-TV services.”²⁹ This solidifies the assumption that integrated offers will be the main revenue source of telecom companies in the future. Overall, the number of subscriptions is forecasted to decline by a CAGR of -0.58% from 2022 to 2027.³⁰ NOS has focused on improving the TV experience for customers. In the 4th quarter of 2021, NOS launched the NVIDIA TV SHIELD, an Android TV box that offers 4K HDS picture quality and cinema-like sound experience with Dolby Vision Atmos support. In addition, NOS introduced NOS TV+, which allows subscribers to access to NOS TV via their Apple TV or Android TV boxes. Moreover, NOS integrated Amazon Prime and Netflix into its set-top boxes.

3.1.1.3 Broadband

Total broadband revenue is expected to increase by a CAGR of 1.52% from 2022 to 2027 and reach \$ 1,196mn, while in 2022 it was \$ 1,109mn. Total subscriptions in 2022 were 4.4mn and are expected to reach 5.1mn by 2027, which equals a CAGR of 2.96%. The penetration rate of total broadband, measured by subscriptions as a % of the population, reached 43% in 2022 and is expected to reach 50% by 2027. This growth is influenced by the effort of major players, with NOS being in the leading place, to expand their fiber optic networks and reach more and more households with FttH, while providing subscribers with higher connectivity and faster connection.

3.1.1.4 Fixed Voice

Fixed Voice total revenue in 2022 amounted to \$ 595.7mn and is expected to decrease by a CAGR of -4.7%, reaching \$ 467.7mn in 2027, which indicates a decline in ARPUs in this subsegment. Total subscriptions in 2022 were 4.7mn and are expected to increase by a CAGR of 1.09%. Total fixed voice is divided into two subcategories, namely circuit-switched and Packet-switched. Circuit-switched subscriptions are expected to gradually decrease, dropping from 0.54mn in 2022 to 0.11mn in 2027, while Packet-switched were 4.2mn in 2022 and are expected to increase by a CAGR of 3.10%. This growth is expected to reach 4.84mn in 2027, attributable to the migration from circuit to Packet-switched subscriptions (VoIP and mobile/OTT) services.³¹ VoIP will increase, due to the development of infrastructure in terms of fiber-optic network coverage.

²⁹ (GlobalData 2022)

³⁰ (GlobalData 2023)

³¹ (GlobalData 2022)

3.1.1.5 Regulations & Initiatives

The telecommunication Industry is subject to strict regulations, which play a pivotal role in shaping the industry dynamics. Therefore, the companies need to pay close attention to the developments in the regulatory environment to avoid sanctions and remain compliant. The regulatory bodies, which decisions have an impact on telcos, including NOS on a sector scope are Autoridade Nacional de Comunicações (ANACOM), Audiovisual content Portuguese regulatory authority for media (ERC), Insurance and Pension Funds Supervisory Authority ASF as well as Transversal scope Competition authority (ADC), National Data Protection Commission (CNPd).³²

Government regulations in the telecommunications sector, overseen by the ANACOM, play a pivotal role in shaping market dynamics by controlling access to distribution channels and spectrum. ANACOM is the national regulatory authority (NRA) in Portugal for communications, for the purposes of the law of the European Union (EU) and national legislation; it also inherits the assignments, powers and responsibilities of the Comissão de Planeamento de Emergência das Comunicações. ANACOM's mission is to regulate the communications sector, including electronic and postal communications and, without prejudice to its nature as an independent administrative body, to assist the Government in these areas. To reinforce its Mission, ANACOM has set up three strategic goals. Firstly, to help the whole country to gain the maximum benefit in terms of choice, price, quality and security of postal and electronic communications services, through active and demanding regulation that promotes efficient investment, facilitates infrastructure sharing and ensures fair and dynamic competition. Secondly, to ensure maximum protection of the rights of communications users throughout the territory and especially among the most vulnerable communities, by promoting a regulatory framework that priorities information and transparency and discourages and sanctions bad practices. Thirdly, to strengthen and make regulation in Portugal more accountable, by fully respecting its autonomy, impartiality, and independence as well as by demanding the strict fulfilment of its mission, particularly by sharing information and knowledge and encouraging the efficiency and economy of means and resources essential to the full acceptance of its responsibilities³³.

According to the ANACOM multiannual activity plan for 2023-2025, several of the strategic actions for the period will be focused on promoting legislative

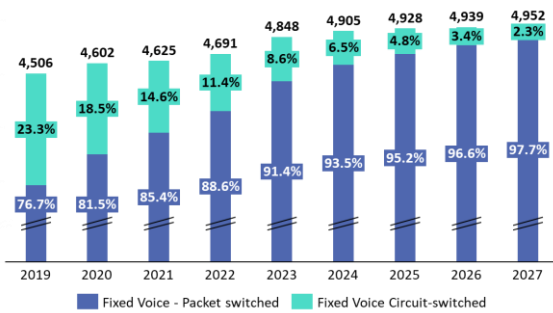


Figure 34: Fixed Voice Subscriptions [k]

Source: (GlobalData 2023)



Figure 35 : Logo Autoridade Nacional de Comunicações

Source: (ANACOM 2023)



Strategic goal 1:
Maximum benefit in terms of choice, price, quality and security of postal and electronic communications services

Figure 36: Strategic Goal 1

Source: (ANACOM 2023)

³² (NOS SGPS, S.A 2023)

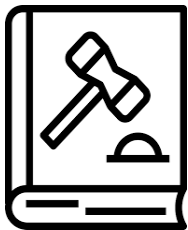
³³ (ANACOM 2023)



Strategic goal 2:
Maximum protection of the rights of communications users

Figure 37: Strategic Goal 2

Source: (ANACOM 2023)



Strategic goal 3:
Strengthen and make regulation in Portugal

Figure 38: Strategic Goal 3

Source: (ANACOM 2023)

measures to reduce the cost of deploying high-speed electronic communications networks, analyzing the wholesale capacity market with potential further obligations on operators, planning and making spectrum available for new applications and services, update regulatory framework applicable to radio licensing, review the National Frequency Sharing Agreement, adopt measures related to broadband internet access, within the scope of the Universal Service for Electronic Communications, promote solutions for access to free television for the entire population. In 2023, ANACOM has dedicated a budget of € 6.7mn, with the most important project highlights for the year including updating and renewing existing infrastructure for spectrum supervision.

As of November 2022, an amendment to the Electronic Communications Law (ECL) was enforced. The changes relate to specifying situations under which early terminations of contracts must be granted without charging a fee to the customer as well as relates to loyalty periods and temporary suspension of contracts. Furthermore, changes to spectrum management, roaming, and mobile infrastructure sharing are involved. ANACOM's powers in spectrum management are further enhanced, as it has gained authority to promote radio spectrum sharing, allowing determination by ANACOM or agreements between operators, within competition law limits, ensuring efficient spectrum use. ANACOM has been further granted the authority to adjust the duration of frequency rights, ensuring simultaneous expiry, especially relevant for future spectrum auctions. Additionally, ANACOM can amend frequency rights to correct competition distortions caused by transmission or hoarding, promoting effective competition.³⁴ Furthermore, Portugal is also subject to EU rules and regulations. For example, the entry into force of Regulation (EU) 2018/1971 of the European Parliament and of the Council resulted in a decrease in telecommunications prices in 2019. This regulation introduced a maximum price for international calls and text messages within the EU. It is estimated that without this regulation, prices would have continued to rise. On the other hand, the telecommunications sector in Portugal can also benefit from EU initiatives. According to a McKinsey article, the EU plans to invest around €160bn by 2027 to promote "digital technological sovereignty", which could to a certain extent enable telecommunication companies to grow. This investment will aim to close the technological gap that exists between Europe and its competitors, which is likely to drive up demand for telco services.³⁵

³⁴ (Lexology 2022)

³⁵ (McKinsey & Company 2023)

3.1.2 Global Telecommunication Trends

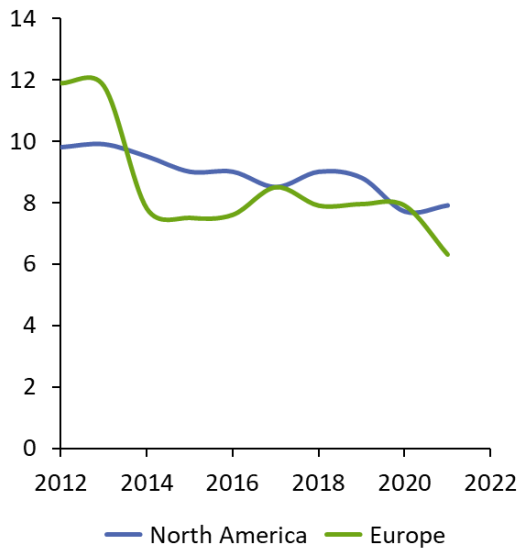


Figure 39: Median ROIC including goodwill, top-50 global telecom operators by market cap [%]

Source: (McKinsey & Company 2023)

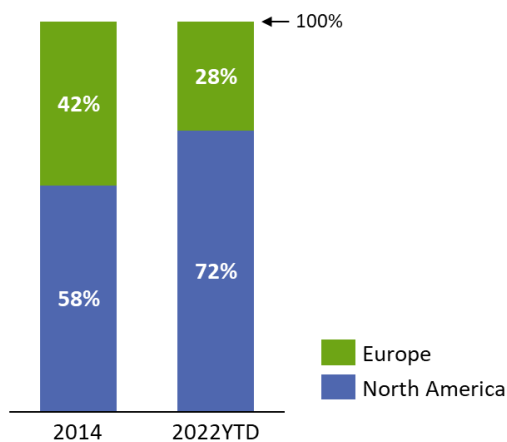


Figure 40: Share of market cap telcos North America versus Europe [%]

Source: (McKinsey & Company 2023)

The telecom industry on a global scale is mainly focused on delivering value to the customer through bundled offerings as the demand for connectivity and cost efficiency increases. This topic is expected to persist, as companies will need to balance the need for high investments in infrastructure, such as fiber and 5G networks, while managing price levels of bundle offers, with the risk of diluted revenues. Bundles include mobile and fixed broadband as well as entertainment services subscriptions in order to satisfy customer demand. Telcos are facing potential threats to the scalability of 5G FWA, if more bandwidth-intensive apps are popularized. These potential scalability issues can be mitigated through advancement in technology. However, Telco companies might face challenges due to the lead time required to develop new infrastructure and keep up with the evolving technological landscape and changes in trends. As the report emphasizes, companies need to strengthen their sustainability practices by reducing waste, emissions and energy consumption, while at the same time the costs of energy, wages and network equipment are rising due to higher inflation.³⁶ According to a McKinsey article that discusses the outlook for European Telcos, European companies have lost more market value than American ones. Furthermore, with the worsened economic outlook due to higher inflation, Telco companies are under greater pressure, as customers become more price-sensitive, and margins are squeezed. While telco revenues are quite resilient despite downturns and price increases are possible, Telcos should proceed with caution, as customers are accustomed to lower prices and are basing their choices for providers mainly based on cost considerations. Depending on the market trends in the various countries, telecoms providers are therefore forced to focus on "delaying", i.e. generating growth from new business areas. In order to generate new streams of revenue, companies might consider having separate activities into autonomous units, solely concentrated on growth. This is known, as "delaying" and aims to achieve value creation.³⁷ According to the article, telecom providers are exploring various solutions, including venturing into B2C services within related industries or engaging in additional digital services. As a given example, Spain's MasMovil has established a consumer finance service through a joint venture with BNP Paribas. Others offer targeted digital solutions such as focused on cybersecurity, cloud, IoT B2B digital services. For telcos to implement successful delaying, each new

³⁶ (Deloitte 2023)

³⁷ (McKinsey & Company 2023)

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business unit needs to have clearly defined systems, processes, and resources, while simultaneously working together with the other units that form a company. Naturally, the extent to which telcos can benefit from “delaying” is also dependent on the respective company’s market, size, and competitive dynamics, however, it is one solution to tapping into new growth opportunities to ultimately deliver value to shareholders.³⁸

3.2 Telecommunications Competitive Landscape

3.2.1 Major Players

The Portuguese telecommunications market is characterized by the presence of a few large players that dominate the market and benefit from economies of scale. While profit margins have been decreasing through price sensitive clients as well as a lack of product differentiation, the overall market has experienced steady growth in recent years and is largely formed by three main players – MEO (a brand from Altice Portugal, formerly known as Portugal Telecom), Vodafone, NOS as well as smaller players such as NOWO.^{39 40} According to ANACOM data, MEO has the highest market share for all sub-segments, followed by NOS.⁴¹ MEO maintains the dominant player by offering a comprehensive range of services (including fixed-line, mobile, and broadband), supported by strategic partnerships and technological improvements. MEO aims to shift copper-based fixed clients to FTTH networks.

As per ANACOM decision as of May 2023, “MEO is required to offer wholesale virtual local access to fiber in addition to wholesale bitstream Ethernet access offer, giving competing operators local fiber connectivity with configurable internet speeds of up to 1 Gbps”.⁴² NOS is well-positioned in every sub-segment, making it the second-largest player in Portugal. NOS offers a wide range of products and services, including “ICT/IoT/Cloud services. Additional services include the alarm system offering and “Playce” advertising company, as well as a range of equipment, travel, and invoicing insurance.⁴³

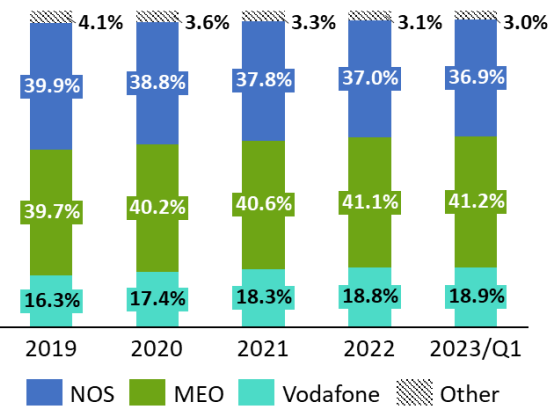


Figure 41: Pay TV Subscriptions Market Share Q1/23 [%]

Source: (NOS SGPS, S.A 2023)

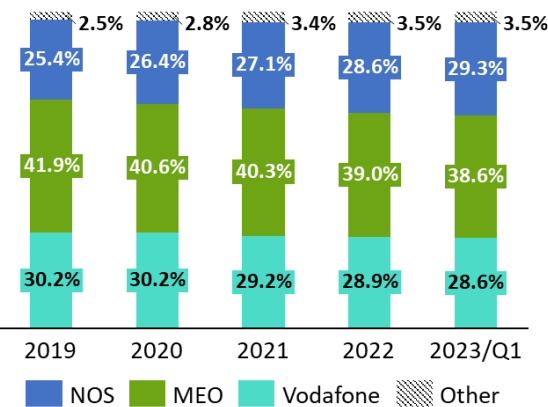


Figure 42: Mobile Subscriptions Market Share Q1/23 [%]

Source: (NOS SGPS, S.A 2023)

³⁸ (McKinsey & Company 2023)

³⁹ (MarketLine 2023)

⁴⁰ (GlobalData 2023)

⁴¹ (NOS SGPS, S.A 2023)

⁴² (GlobalData 2023)

⁴³ (GlobalData 2023)

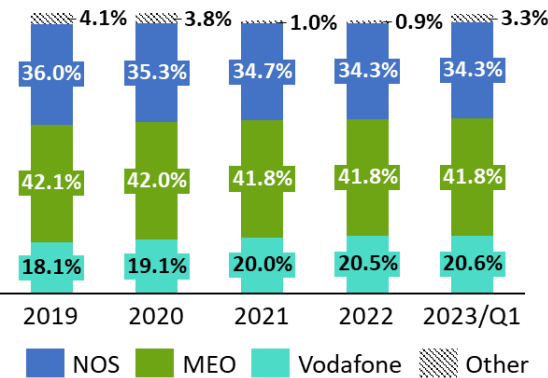


Figure 43: Fixed Voice Subscriptions Market Share Q1/23 [%]

Source: (NOS SGPS, S.A 2023)

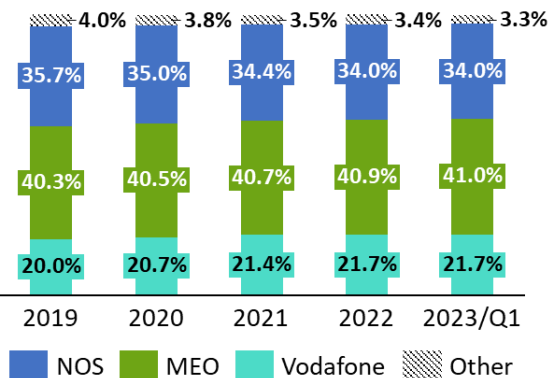


Figure 44: Fixed Broadband Subscriptions Market Share Q1/23 [%]

Source: (NOS SGPS, S.A 2023)

Vodafone Portugal is the third largest player and offers services such as mobile and broadband internet. Vodafone's investment in emerging technologies, such as 5G, and strategic efforts have been focused on monetizing IoT opportunities (V range of IoT products, such as V-Auto, Auto SOS, Find my Car, Safety score) help to maintain its position. Outside of the main players, providers with smaller market shares such as NOWO offer specialized services, attracting customers with cost-effective internet and TV packages offers⁴⁴. Based on the Fitch rating report released on October 5, 2023, NOS currently commands a 31.6% market share of revenue, reflecting an increase from the previous year's 31%. ⁴⁵ However, this stronghold faces an imminent challenge with the entry of a new competitor into the Portuguese telecommunications landscape – DIGI, a Romanian provider. Expected to debut in early 2024, DIGI aims to capture a segment of cost-conscious consumers, posing a direct threat to established players like NOS and MEO. In line with information from DIGI's annual statement and earnings call, the company anticipates the need for a market share ranging from 5% to 10% to achieve break-even. This projection suggests that DIGI is poised for an assertive market entry strategy, and as a result, it is highly likely to erode some market share from well-established players in the industry, such as NOS.

3.2.2 5G Spectrum Allocation

In this market, government is involved through regulatory authorities' permissions for using specific electromagnetic spectrum bands within a country, with allocation taking place through periodic auctions or competitive processes. At the last auction in 2021, NOS has paid € 165.1mn for 700 MHz, 900 MHz, 2100 MHz, 3.6GHz; Vodafone Portugal paid € 133.2mn for 700 Hz/ 3.6GHz, and MEO € 125.2mn for 700 MHz/900MHz/3.6GHz. Nowo and Dixarobil both have obtained spectrum rights in 3.6GHz band.⁴⁶ According to the Strategic Spectrum Plan published by ANACOM in December 2022, NOS is well positioned regarding their allocation per frequency rate. The allocated spectrum is and will continue to enable NOS to maintain its position as a leader in 5G as well as enable it to reinforce 4G network, as it has won the highest proportion of spectrum achieving the maximum possible frequencies (3600 MHz).

⁴⁴ (GlobalData 2023)

⁴⁵ (Fitch Ratings 2023)

⁴⁶ (GlobalData 2022)

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Mobile Spectrum	Amount of Spectrum (MHz)						Maturity of rights of usage					
	NOS	MEO	Vodafone	Nowo	Digi	Dense Air	NOS	MEO	Vodafone	Nowo	Digi	Dense Air
700 MHz (FDD)	20	10	20				Nov.41	Dec.41	Nov.41			
800 MHz (FDD)	20	20	20				Mar.27	Mar.27	Mar.27			
900 MHz (FDD)	15,6	16	10				Nov.27	Apr.33	Apr.33			
900 MHz (FDD)	4,4	4	10		10		2042*	2042*	Mar.33		2042*	
1800 MHz (FDD)	12	12	12				Nov.27	Apr.33	Apr.33			
1800 MHz (FDD)	28	28	28	20	10		Mar.27	Mar.27	Mar.27		Nov.41	
2100 MHz (FDD)	30	40	40				Jun.33	Apr.33	May.33	Nov.41		
2100 MHz (FDD)	10						Nov.41	Mar.27	Mar.27	Nov.41	Nov.41	
2600 MHz (TDD)	40	40	40	10	10		Mar.27	Mar.27	Mar.27	Nov.41	Nov.41	
2600 MHz (TDD)			25		25							
3600 MHz (TDD)						55/100						
3600 MHz (TDD)	100	90	90	40	40	40	Nov.41	Dec.41	Nov.41	Nov.41	Nov.41	Aug.25
Total	280	260	295	70	95							

* Licence issuance process still ongoing. It should be issued on 1Q22, for a 20 year period
The usage is restricted until 5th August 2025, when the current holdings of Dense Air in the 3,6 GHz band expire

Figure 45: Amount of Spectrum and Maturity Rights of Usage
Source: (NOS SGPS, S.A 2022)

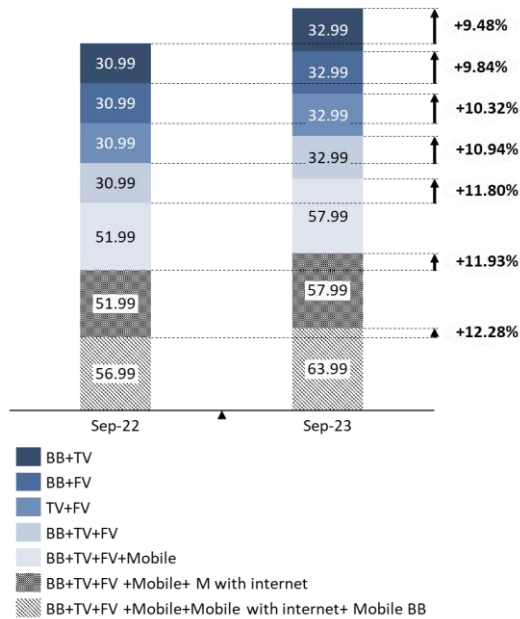


Figure 46: NOS Monthly Minimum Price per Bundle [€]

Source: ANACOM Trends in telecommunications prices September 22 vs 23

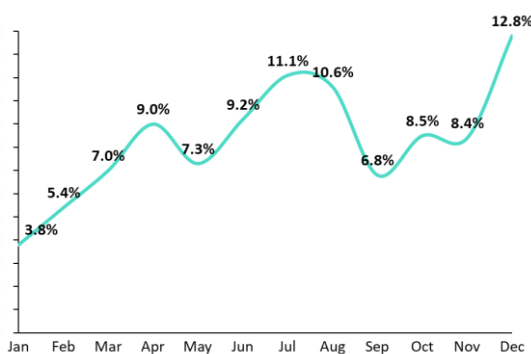


Figure 47: Average Attendance Rate by Month as % of total attendance in mn 2018-2022

Source: ICA Key Statistics Report 2023
Cinema & Audiovisual

3.2.3 Price Trends

In September 2023, telecommunications prices in Portugal experienced an increase of 4.0% yoy. This price increase in Portugal exceeded the EU's average price change over the last twelve months by +2.1pp. Over the long term, telecommunications prices in Portugal have increased by 14.4% since the end of 2009, which is lower than the increase in the Consumer Price Index (CPI) of 29.1% over the same period. Compared internationally, Portugal's telecommunications prices increased by 14.4% between the end of 2009 and August 2023, while the EU experienced a decrease of 8.7% in the same timeframe. ANACOM provides monthly reports on price trends, showing the minimum monthly fees for the various services and offers in the periods, according to publicly available information on the company websites. The categories include TV, Broadband, Fixed Voice, Mobile, Mobile with internet, and Mobile broadband. Further categories reported show the minimum prices per competitor for bundles, created from the above-mentioned categories. According to the September report 2023, NOS, relative to MEO, Vodafone, and NOWO only has the lowest price offer for "Mobile with the internet" category. NOS has been maintaining the second lowest price in the most comprehensive bundle after Vodafone. As compared to the same month previous year, NOS has increased the prices by 12,28% in September 2023. Vodafone has done the same by 12.30%. On the other hand, NOWO offered the lowest monthly fees for seven out of eleven service types, while MEO and Vodafone had the lowest monthly fees for three out of 13 total categories and one service types, respectively. (Appendix Figure 2; Figure 3) Compared to the same month last year, NOS has decreased its price only for fixed voice service offer, while increasing the rest, consistent with actions taken by competitors, especially regarding the bundles.^{47 48}

⁴⁷ (ANACOM 2023)

⁴⁸ (ANACOM 2023)

3.3 Audiovisual Industry Dynamics

Although in Europe, different markets vary in terms of market dynamics, it can be argued that the overall industry trends are likely to follow a very similar trajectory, albeit to varying degrees. The movie and entertainment industry in Europe has declined by a CAGR of 7.5% between 2017 and 2022, amounting to \$ 11bn in 2022. This decline is attributed to changes in consumer preferences, as demand shifted toward platforms such as Netflix. In 2022 there has been a notable increase in growth of 16.9%yoy, as consumers have spent more on offers provided by DTH and digital cable providers, as well as an increase in demand for TV series and films. The music and video segment represented 57% of the overall market value in 2022, while box office segment was responsible for 43%. The movie and entertainment market is forecasted to grow by CAGR of 6% until 2027, expected to be driven by demand for 3D films, fueled further by advancement in technologies that improve customer experience such as VR and AR.⁴⁹ Admissions in cinemas have not yet fully recovered since the negative effect of the pandemic, with the highest admissions in 2019 of 15.5mn, reaching revenue of € 83.2mn. While still recovering, the annual admissions have increased gradually since 2020 reaching € 9.6mn in 2022 and € 55.4mn in revenue. As of the end of 2022, there were 190 cinema sites in Portugal and 569 screens, out of which 531 are digital screens 2K/4K and 248 depict 3D content, with total seats of 111,907. The average ticket price has reached € 5.76 in 2022, representing a gradual increase since 2018 when the average price was € 5.32, which equals a CAGR of 1.60%. In 2022, the highest number of admissions was in December with 1.2mn, followed by July with 1.1mn, with these seasonality patterns occurring for historic periods. In terms of film exhibitions split by admissions market shares, since 2018 NOS Lusomundo Cinema has consistently held the highest market share versus other distributors since 2018, with a market share of 65.1% in 2022, followed by 10% of UCI and 8.9% Cineplace. In contrast to film distribution, market share, split by admission, where it can be observed that NOS has decreased its market share measured in admissions significantly from 65.2% in 2018 to 45.7% in 2022. Signifying that although NOS distributes a smaller number of films, the number of people who choose NOS's venues has not decreased. In terms of GBO per distributor in 2022, NOS Lusomundo Audiovisuals generated the highest GBO relative to other distributors of €26mn out of €55mn in total⁵⁰.

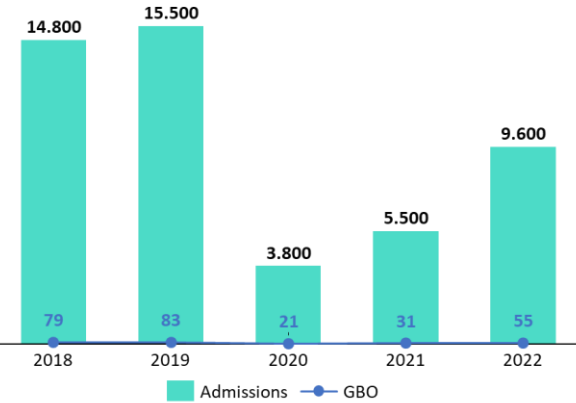


Figure 48: GBO (€) and Admissions Annual Evolution (k)

Source: ICA Key Statistics Report 2023 Cinema & Audiovisual

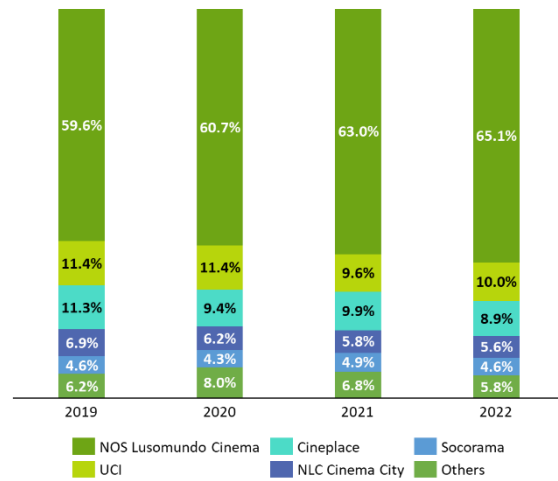


Figure 49: Market Share by Admissions [%]

Source: ICA Key Statistics Report 2023 Cinema & Audiovisual

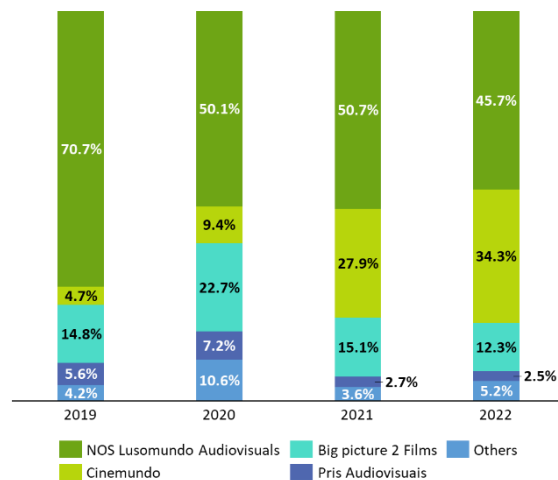


Figure 50: Market Share by Distributions [%]

Source: ICA Key Statistics Report 2023 Cinema & Audiovisual

⁴⁹ (MarketLine 2023)

⁵⁰ (ICA 2023)

4 Environmental, Social & Governance

In this section, the NOS is presented from various perspectives, from the strategic pillars of sustainability to an analysis of NOS in comparison to its competitors with regard to the individual environmental, social and governance aspects.⁵¹ The analysis uses mainly the Refinitiv notation as the basis for analyzing each column, with all scores from 0 (worst) to 100 (best). All data is from the last year of publication by Reuters, i.e. 2021, as data on greenhouse gas emissions is only available from Bloomberg and Refinitiv from the end of 2021. Each parameter used in the Refinitiv scoring has a different weight in the overall score, which is as follows:

Environment:	20.3%
Social:	53.2%
Governance:	26.5%

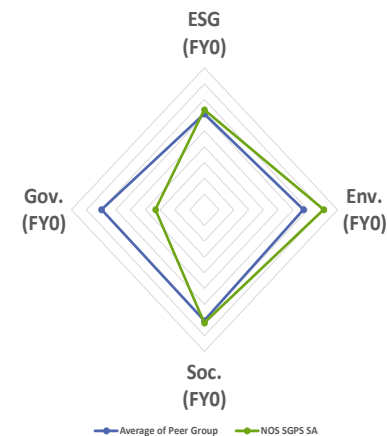


Figure 51: NOS Refinitiv Combined Score

Source: (Refinitiv 2023)

	Refinitiv ESG Combined Score	Bloomberg ESG Score	Sustainalytics ESG Risk Score	S&P ESG Global Rank	ISS Quality Score	CDP Performance Score
Average	60.75	77.5	18.73	75.50	3.77	6.69
NOS SGPS	63.45	89.1	14.30	80.00	10.00	8.00

Figure 52: Figure Combined ESG Scoring

Source: (Bloomberg L.P 2023)

On a global scale of 100 points, NOS is slightly above its peer group in terms of Refinitiv's combined ESG score (63.45 | peer average: 60.75) and the Bloomberg ESG Percentile Score (89.10 | peer group: 77.50).

Among other providers that measure the quality of ESG risk management (Standard & Poors, Sustainalytics, ISS and CDP), NOS ranks above average in their respective scales. It should be noted that all scores are ranked highest (best) to lowest (worst), apart from Sustainalytics, which ranks ESG risk which translates for a higher score (higher risk) and lower score (lower risk).⁵²

4.1 Environmental

Among the three aspects, the environmental parameter is the one in which NOS is the leader both in its peer group (Refinitiv Peer Group) and in the industry in general. At the end of 2021, NOS ranked eighth in the environment pillar among the 186 telecommunications companies covered by Refinitiv. In

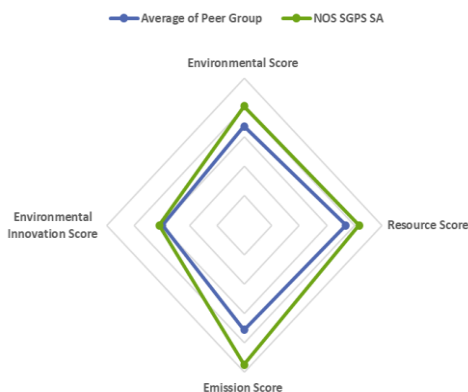


Figure 53: NOS Refinitiv Environmental Pillar Score

Source: (Refinitiv 2023)

⁵¹ **Peer Group:** Vodafone Group Plc, Koninklijke KPN NV, Swisscom AG, Orange S.A, Telefonica S.A., Liberty Global Plc, Elisa OYJ, Telecom Italia AB, Hellenic Telecommun Organiza, Telekom Austria AG, Tele2 AB, Freenet AG, Digi Communications NV

⁵² (Bloomberg L.P 2023)

Group Part

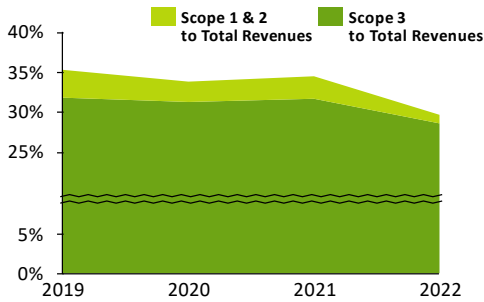


Figure 54: Scope 1&2 and Scope 3 in % of Revenue
Source: (Refinitiv 2023)

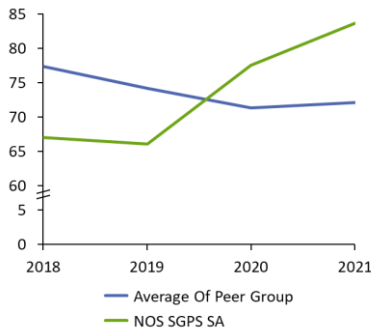


Figure 55: Resource Use Score vs. Peers
Source: (Refinitiv 2023)

Company Name	Base Year	Target decrease Scope 1&2	Target Date
Orange	2018	29%	2025
Swisscom			
Vodafone Group Plc	2020	90%	2030
Telefonica	2016	80%	2030
Royal KPN	2010	100%	2030
Liberty Global	2019	50%	2030
Elisa Corporation	2021	42%	2030
Telia Company	2018	90%	2030
Telecom Italia			
Hellenic Cables	2020	50%	2030
A1 Telekom Austria Group	2019	50%	2030
Tele2 AB	2019	100%	2029
freenet AG			
Digi Communications NV			
Average Peer Group	2018	68%	2029
NOS, SGPS, S.A.	2019	90%	2030

Figure 56 : SBTi Data Scope 1&2
Source: (Science Based Target initiative 2023)

Company Name	Base Year	Target decrease Scope 3	Target Date
Orange	2018	14%	2025
Swisscom			
Vodafone Group Plc	2020	50%	2030
Telefonica	2016	56%	2030
Royal KPN	2010	20%	2025
Liberty Global	2019	50%	2030
Elisa Corporation	2021	42%	2030
Telia Company	2018	50%	2025
Telecom Italia			
Hellenic Cables	2020	25%	2030
A1 Telekom Austria Group	2019	50%	2030
Tele2 AB	2019	60%	2029
freenet AG			
Digi Communications NV			
Average Peer Group	2018	42%	2028
NOS, SGPS, S.A.	2019	30%	2030

Figure 57: SBTi Data Scope 3
Source: (Science Based Target initiative 2023)

the comparison group selected, NOS outperformed its competitors with a score of 81 compared to 68. This means that NOS performs better than the average in terms of both emissions (95 | peer average: 73) and resource utilization (84 | peer average: 74). The third parameter, environmental innovation, is slightly above the average (62 | peer average: 57).

The first strategic pillar of the company is named “On behalf of the planet”. In this section several objectives can be identified that the company articulates in order to combat climate change and in the circular use of resources, including a reduction in Scope 1&2 and Scope 3 CO₂ emissions as well as the use of renewable energy sources and the circularity of their products and own operations. Scope 1 refers to emissions that are generated as part of the company's operational activities, while Scope 2 measures emissions that the company generates as part of its corporate functions, such as electricity consumption in accounting. Scope 3 is the most important and difficult to comprehend as it represents emissions made by suppliers and consumers.⁵³ It is noted that NOS has submitted several objectives related to CO₂ emissions to the institution science-based targets initiative (SBTi) to assess the feasibility of their goals. The institution is a result of a partnership between the Carbon Disclosure Project, the UN Global Compact, the World Resources Institute and the Worldwide Fund for Nature.⁵⁵

In connection with SBTi, it should be noted that of the 14 companies in the peer group, only four companies (approx. 30%) have not committed to a net zero target. NOS is therefore not completely outstanding in this aspect. If the observation is deepened further in the commitment of each company some major differences are noticeable despite ten of them being committed to net-zero. In terms of Scope 1&2, NOS has set itself the target of reducing 90% of its emissions by 2030 compared to the base year 2019, which is more than the peer group average of 68%. For Scope 3, a reduction of 30% by 2030 has been targeted, which in this case is below the peer group (42%). Standards & Poors realized an assessment (2nd Parts Opinion as of 2nd February 2022) of how the metrics are calculated by NOS and how relevant they are. Both are considered as highly relevant and calculated in an auditable way. It is mentioned that Scope 3 is highly sensitive in the context of NOS, accounting for more than 90% of their emissions in 2021 and 2020. This could explain why they didn't commit to a higher target considering the high proportion of

⁵³ (Deloitte 2023)

⁵⁴ (NOS SGPS, S.A 2023)

⁵⁵ (Science Based Target initiative 2023)

Group Part

scope 3 for NOS.⁵⁶ With regard to Scope 3, it should be mentioned that 2019 as the base year led to an advantage in the reduction of emissions for NOS. From 2020 onwards, NOS benefited from a decrease in the measurement of their emissions tracking that was artificially caused by slowing economic activity during pandemic and not by the actions of NOS.

4.2 Social

The social pillar accounts for more than half of the final score and NOS ranks 39th among the 186 companies in the Reuters pool with a result slightly above average (72 versus 70 for the selected peer group) as well as in Community (74 | peer average: 70), and with a higher edge on Product Responsibility (86 | peer average: 73). It should be noted that the company should not be judged on the human rights pillar as this information is misrepresented on Refinitiv. In fact, NOS should benefit from a higher rank on this specific one.

Three pillars can be identified in the NOS strategic plan that are directly related to social objectives. The first one “For a digital Future” has the main goal to democratize access of technology including to the most vulnerable audiences. The objectives of the projects are illustrated by teaching in computer science schools, with the aim of reaching 10,000 pupils which is already on going on 1st to 6th grade classes, and by contributing to smart city projects to provide environmental and social benefits to over half a million connected objects such as phone, tablets for instance.⁵⁷

The second pillar on this subject is named “More for our People”, which aims to improve the employee satisfaction index and increase the proportion of women in management positions. They are already well on the way to achieving this goal, as they are performing better than the average of the peer group according to Bloomberg data, with 33% women compared to 29% in management positions. The last pillar, “Ethical and Responsible Management”, includes two parameters that are directly linked to social aspects. Firstly, NOS has set itself the goal of carrying out a 100% social and environmental risk assessment of its suppliers by 2025. Secondly, employees are to be trained in ethical behavior. Whereby, 98% of employees have already been trained, according to NOS. The company has also improved in the other aspects measured in recent years. The introduction of a cyber security policy and corporate responsibility awards are examples of these improvements. These changes led to a turning point for NOS, which has now

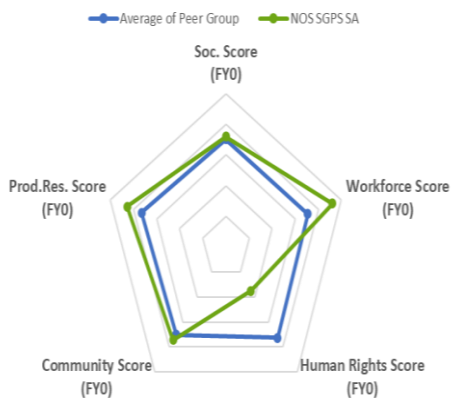


Figure 58: NOS Refinitiv Social Pillar Score
Source: (Refinitiv 2023)

	Women on Board	Women in Management	Women in Workforce
Average	33%	29%	35%
NOS SGPS	33%	33%	41%

Figure 59: Social Scoring on women in diverse company levels
Source: (Refinitiv 2023)

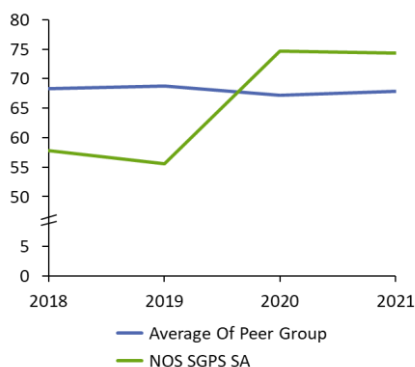


Figure 60: Community Score vs. Peer Group
Source: (Refinitiv 2023)

⁵⁶ (Standards & Poors 2023)

⁵⁷ (NOS SGPS, S.A 2023)

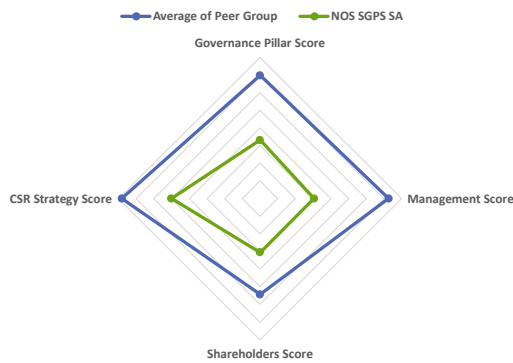


Figure 61: NOS Refinitiv Governance Pillar Score

Source: (Refinitiv 2023)

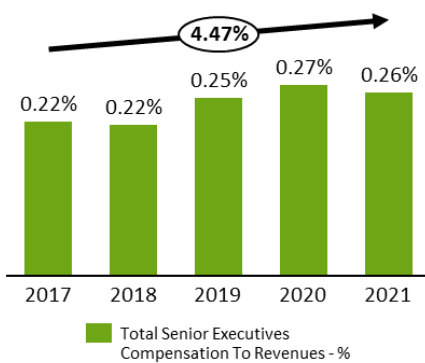


Figure 62: Executives Compensation to Revenues [€, mn]

Source: (Refinitiv 2023)

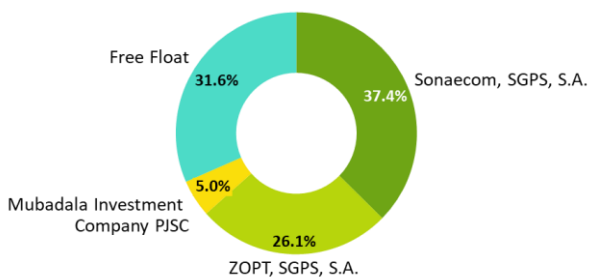


Figure 63: Shareholders Composition [%]

Source: (Refinitiv 2023)

outperformed its peer group for two consecutive periods.⁵⁸

4.3 Governance

In the overall corporate governance score it is noticeable that the NOS performs worse than their peers (33 | peer average: 70) in the pillar score as well as each of the three parameters used to calculate the overall score. This can be explained by the following parameters. For instance regarding management score (31 | peer average: 73), the compensation of executives increased approximately by a CAGR of 3.8% in the period from 2017 to 2021, while revenues decreased by a CAGR of approximately 2% over the same period (Figure 62). On their CSR strategy grading (50 | peer average: 78) they improved significantly compared to the last years mainly by disclosing how their objectives answer to meaningful SDG (Sustainable development goals), which have been exposed in their pillars and strategic target. For example, “On Behalf of the planet” is recognized to contribute into the objectives 7 (clean energy), 12 (responsible consumption and production) as well as 13 (climate action).⁵⁹

Regarding shareholders’ score (31 | peer average: 54) it is observable that NOS does not apply a policy that is quite shared among its competitors. Meaning the firm does not treat all shareholders equally in terms of voting rights. In fact, due to its ownership structure, SONAE holds more than 50% of the company's shares and can therefore utilize its veto right, which is considered a negative governance parameter. This majority is executed via the direct ownership of Sonaecom of 37.4% and the indirect possession of 26.1% by using the company ZOPT as a subsidiary of Sonaecom (Figure 63).⁶⁰

⁵⁸ (NOS SGPS, S.A 2023)

⁵⁹ (NOS SGPS, S.A 2023)

⁶⁰ (Refinitiv 2023)

5 Financial Analysis

The following financial analysis of NOS was carried out on the basis of the financial data, published by NOS, for the period Q1/2019-Q3/2023. The forecast of each item has been performed on a quarterly basis for each segment “Telecommunications” and “Audiovisuals” until Q4/2023 and annualized for visualization and comprehension purposes. All the market related data was obtained on the valuation date, 6th of November 2023.

5.1 Revenue Forecast

The revenues of NOS are categorized into two main segments: telecommunications and audiovisuals. Each of these segments is then subdivided into three distinct revenue streams, namely services rendered, sales, and other operating revenues. In the audiovisual segment, services rendered can be further delineated into cinema-related services and media. For the cinema-related services within the audiovisual segment, the forecasting methodology involves a twofold approach. Firstly, the projection of tickets sold relies on insights derived from a comprehensive Market Line study of European movies and entertainment.⁶¹ This study serves as a key reference point for estimating consumer demand for cinema experiences. Secondly, the pricing aspect is determined by forecasting the price per individual ticket. Since NOS is the market leader in Cinemas in Portugal, the price projection is based on inflation forecasts, which serves as a proxy measure. This assumption is based on NOS's strong market position as a leader in the cinema industry, suggesting that the company has the capability to transfer any incurred cost increases to its customers.

In the audiovisual segment, the forecast for the media division aligns with NOS projections outlined in the most recent annual statement until the year 2026. Beyond that point, a slower decline is anticipated, reflecting an uncertain trajectory of media entertainment. As for sales within the audiovisual segment, a significant portion is attributed to concession stand sales in movie theaters. To project these sales figures, a historical ratio of sales to tickets sold is employed. The rationale behind this methodology is grounded in the concept that each ticket sold corresponds to an individual attending the cinema. Therefore, sales are perceived as the “average spend” of a customer, and historical patterns in the ratio between sales and tickets sold serve as a reliable basis for forecasting future concession stand sales in movie theaters

⁶¹ (MarketLine 2023)

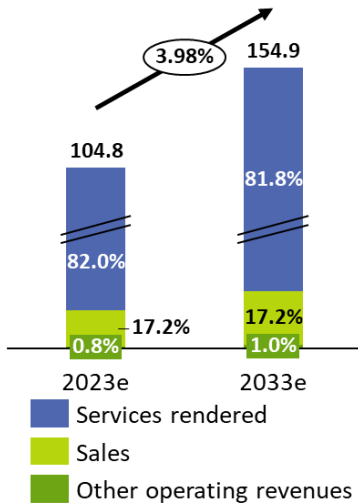


Figure 64: Audiovisuals Revenue Breakdown [€, mn]
Source: Group Analysis

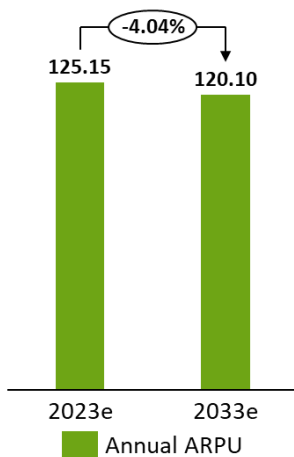


Figure 65: ARPU Evolution [€]
Source: Group Analysis

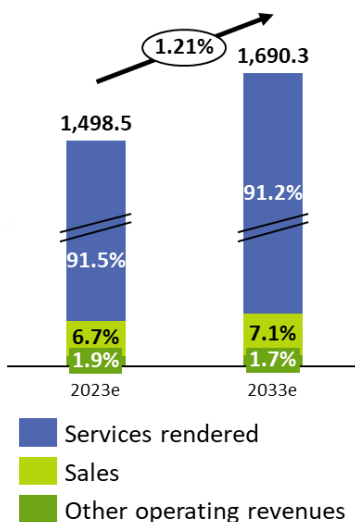


Figure 66: Telco Revenue CAGR [€, mn]
Source: Group Analysis

Group Part

within the audiovisual segment.

In the telecommunications segment, the Services Rendered category can be distilled into two key variables: Revenue Generating Units (RGUs) and Average Revenue Per User (ARPU), where revenue is equal to the product of these variables. The Revenue Generating Units (RGUs) concept encompasses six distinct products, each with its dedicated subscriber base. These products offer flexibility, allowing customers to opt for individual purchases or bundled packages. Opting for bundled deals results in a discounted rate, promoting the uptake of comprehensive packages. To project the growth rates of specific subscriber groups, a thorough methodology is employed, drawing insights from Global Data⁶² which offers valuable insights into the anticipated expansion of subscribers in various segments and growth in revenue. In parallel, ANACOM conducts thorough research on historical price increases, enabling the analysis of past pricing data for the calculation of "Bundle Discount".⁶³ This dual perspective allows for a comprehensive understanding of both subscriber dynamics and revenue growth, as well as a nuanced examination of pricing trends over time. Notably, the Portuguese market, as highlighted in NOS's recent earnings release call, is saturated, prompting a strategic focus on cost reduction rather than revenue expansion to enhance margins. Under this strategic orientation, the Compound Annual Growth Rate (CAGR) for total Revenue Generating Units (RGUs) is projected at 1.53%. This projection includes a Mobile RGUs CAGR of 2.25%, a Pay TV CAGR of -0.80%, a Fixed Voice RGUs CAGR of 0.53%, and a Broadband RGUs CAGR of 1.96%. The projection of Average Revenue Per Unit (ARPU), historically computed as the revenue from services rendered divided by total revenue-generating units, involves forecasting prices for each product and utilizing their projected subscriber bases from the RGU forecast to calculate a weighted average. To account for "Bundle Discount" resulting from company promotions, prices are retroactively adjusted based on ANACOM's reported price increases, forming the basis for pre-bundle ARPU. The variance between the theoretical ARPU and the actual one represents the "Bundle Discount," utilized to forecast the impact of these discounts, calculated as a historical average, on future ARPU. Additionally, the analysis encompasses forecasting product prices by comparing NOS's current pricing, as reported on their website, with that of competitors, and integrating the aforementioned insights from Global Market and ANACOM research reports. By considering

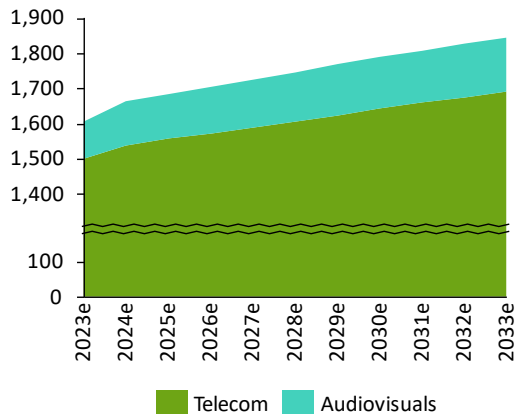


Figure 67: NOS Revenue Breakdown [€, mn]

Source: Group Analysis

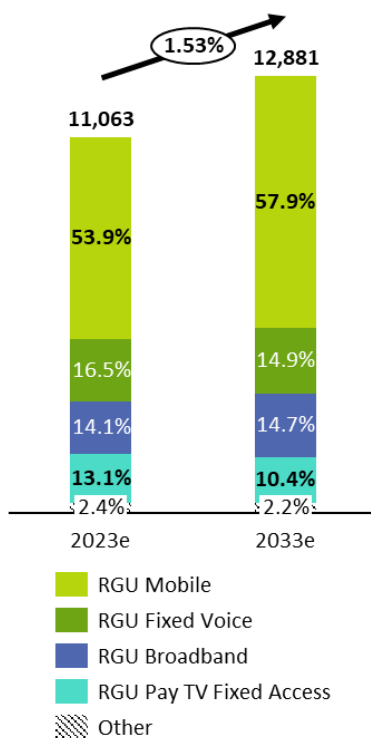


Figure 68: RGUs Breakdown & CAGR [%]

Source: Group Analysis

⁶² (GlobalData 2023)

⁶³ (ANACOM 2021)

Group Part

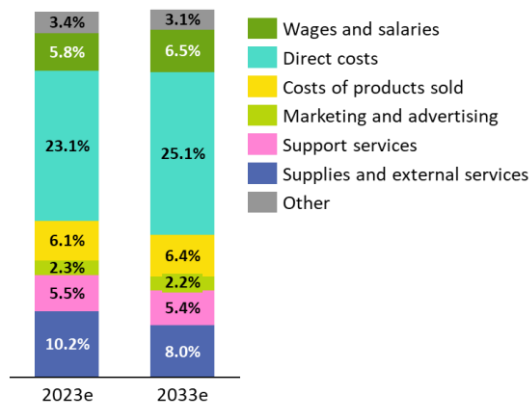


Figure 69: Operating Costs in % of Revenue

Source: Group Analysis

the "Bundle Discount," future ARPU, and the total RGUs, a comprehensive forecast of revenues from services rendered can be extrapolated. NOS has explicitly communicated a lack of emphasis on sales during their presentation. Instead, their revenue stream involves the sale of devices bundled with overall deals to customers. However, due to low leverage with suppliers, the profit margins from these sales are notably slim. To project this segment's performance, an inflation forecast was utilized as a proxy to mirror the anticipated increase in the prices of electronics. Additionally, it's noteworthy that Q4 experiences distinct seasonality, likely attributed to Black Friday and Q4 increase over the average sales in other quarters has been analyzed. This historical pattern has then been applied to Q4 forecasts to enhance the accuracy of predictions.

5.2 Operating Costs Forecasts

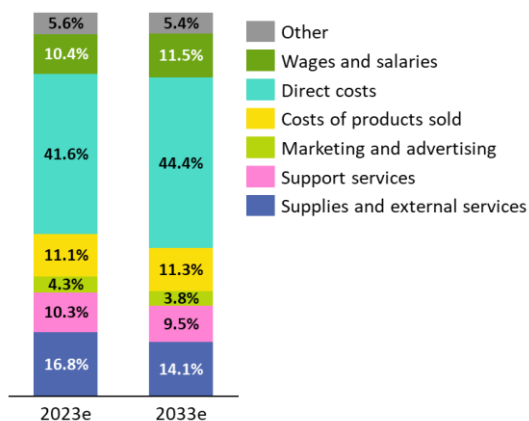


Figure 70: Operating Costs in % of Total Costs

Source: Group Analysis

At the Group level, the most impactful item is direct costs, which represented on average 25% of total revenue over the past four years. This item is mainly determined by customer demand, as it mainly consists of exhibition and traffic costs in the case of Telco, which is the main driver for the whole group. It is expected that direct costs will stay at the same level of 27.24% in relation to services rendered as they have been in the period from 2019/Q1-2023/Q3, offsetting the recent decrease, which is assumed to be not sustainable when new technologies will come forward. As with income, there is also a seasonal effect for direct costs: they are systematically higher in the last quarter of the year than in the three preceding quarters, which has been reflected in the forecast (30.63% of services rendered). Therefore, at group level it is expected that their share of operating costs will increase and reach 44.4 % by 2033e, while their share of revenue is likely to remain at around 25.1 %. At its last annual results conference (Q3/2023), the company announced its intention to increase efficiency by digitizing processes, e.g. call centers are increasingly being transformed into self-service platforms that customers can use as and when they need them. Those modifications will impact two sections of NOS's Telco business: support services as well as supplies and external services. To apply those efficiencies, the model uses historical decreases which were observable in the period from 2020-2022. Support services and supplies and external services are both expected to decrease respectively of 0.05% and 0.08% per quarter over the next two years, which equals in total -0.37pp and 0.61pp over total revenues until the end of 2025e. Afterwards, it is expected that both items remain stable in proportion to revenues with 5.65% (support services) and 8.10% (supplies and external services) from 2026e onwards. While on group level these two items are expected to account for 10.3%

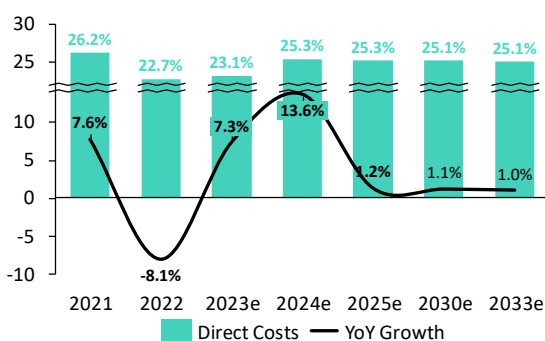


Figure 71: Direct Cost to Total Revenues [%]

Source: Group Analysis

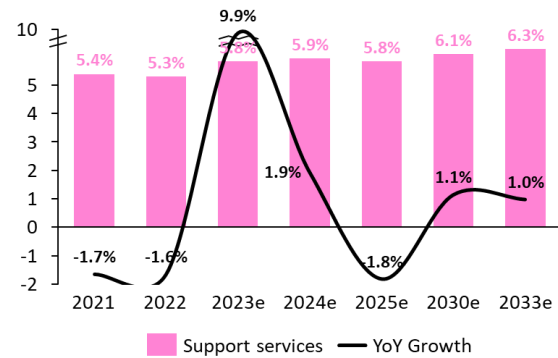


Figure 72: Support services to Total Revenues [%]

Source: Group Analysis

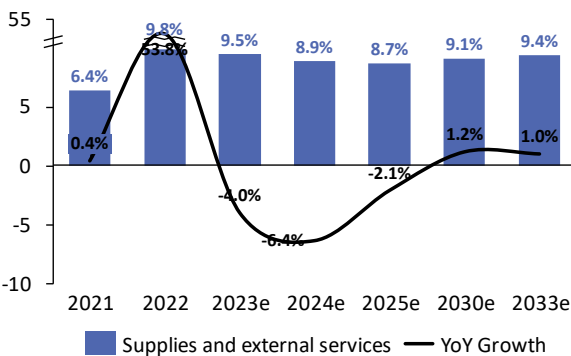


Figure 73: Supplies and external services to Total Revenues [%]

Source: Group Analysis

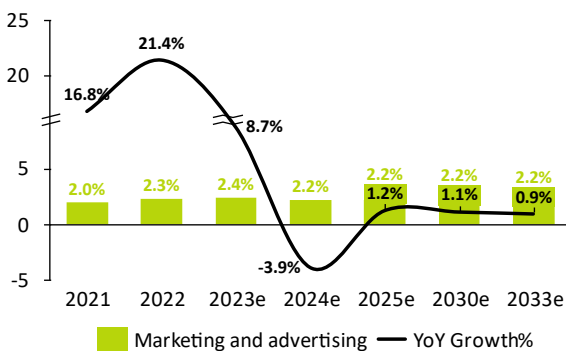


Figure 74: Marketing and advertising to Total Revenues [%]

Source: Group Analysis

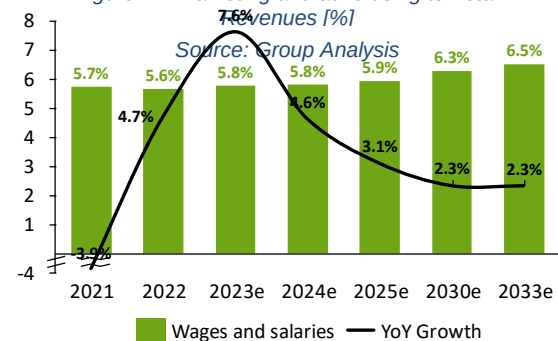


Figure 75: Wages to Total Revenues [%]

Source: Group Analysis

(support services) and 16.8% (supplies and external services) in 2023e in proportion to total operating costs, they are expected to fall to 9.5% as well as 14.1% by the end of the forecast period as visible on figure 71.

However, the costs for marketing and advertising should evolve in the opposite direction. On a macroeconomic level, it was forecasted that Telcos will increase their advertising expenses in the period from 2020 to 2023e. While marketing expenses for telecom companies in the Iberian market are expected to grow at a CAGR of 6.4% over this period, a lower limit was set for the French market, where marketing expenses are expected to increase at a CAGR of 1.3%. As NOS has already experienced a cost spike from € 24.5mn in 2020 to € 34.7mn in 2022 (CAGR 19%), it is assumed that further increase should be significantly lower than what is expected for Spanish companies, as the Iberian market most closely matches the characteristics of the Portuguese market and approach the lower bound of the forecasted numbers, which was set by France. Marketing expenses are forecasted in relation to total revenue (1.63%) and adjusted by a seasonal pattern in Q4 (4.28% over total revenue), which equals a CAGR of 0.85% over the forecasted period for the Telco business.

Since inflation affects wages and salaries with a time-lag, another strong increase is expected until the end of 2024 (2023e: 7.62% | 2024e: 4.62%), before they converge to a lower growth rate, approaching the inflation target of 2.0% in the long-run. Combined with the expectation of an gradual increase in the number of employees with a CAGR of 0.31%, overall personnel costs are forecasted to grow slightly above the inflation target with approximately 2.3% in the long-run. As personnel costs are rising faster than revenue themselves, it is expected that their proportion to revenue will increase from 5.8% in 2023e to 6.5% in 2033e.

Last but not least, the cost of goods sold will evolve at a steady rate without a sharp increase coming from 2023e with 6.1% in proportion to revenues to land on 6.4% by 2033e.

5.3 Financial Costs

Financial costs are broken down into four types of items which are commercial papers, debenture loans, bank overdrafts and leases. The latter one is directly linked to the CapEx activities of the company (See Chapter 5.6: Depreciation & Amortization) as the others are issued by the company for general financing of NOS. It is important to note that NOS considers the level of net debt/EBITDA to be comfortable and has no intention of reducing it. Among those items, the debenture loans are disclosed on Bloomberg and allow a

Group Part

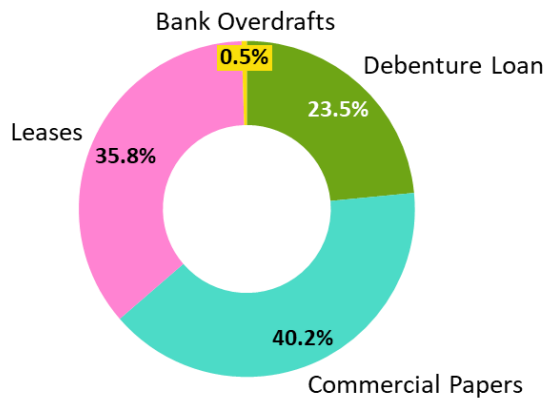


Figure 76: Borrowings Mix as of 2023/Q3 [%]

Source: (NOS SGPS, S.A 2023)

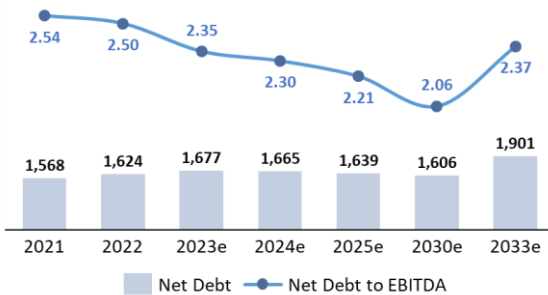


Figure 77: Net Debt [€, mn] & Net Debt to EBITDA [%]

Source: Group Analysis

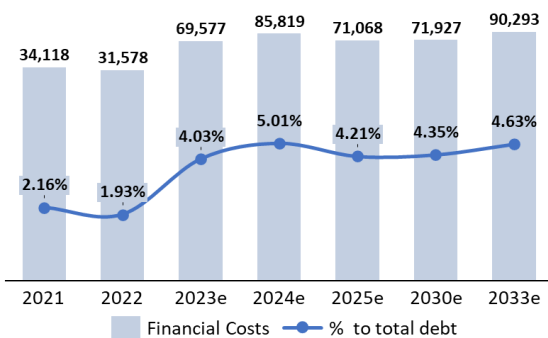


Figure 78: Financial Costs [€, k] & Proportion to total debt

Source: Group Analysis

deeper analysis of their covenants. They are issued bearing quarterly and semi-annual coupon payments based on Euribor 3M or Euribor 6M, in addition to a fixed spread, which was set at issuance.⁶⁴ It is assumed that the interest on commercial paper, overdrafts and leases is paid quarterly at similar rates and spreads as for the debenture loans.⁶⁵ Financing costs have risen sharply in 2022/2023e due to spike in inflation and the resulting restrictive ("hawkish") monetary policy. Since NOS pays coupons solely at a floating rate, they were fully exposed to interest rate risk in the rate hike cycle. As of September 2023, NOS estimates their average cost of debt at around 3.9%. As the last rate hike of the ECB was executed in mid-September, the new level of interest rate is probably not yet fully priced in the aforementioned costs. As of now, it is expected that the ECB won't proceed with further rate hikes in the next upcoming quarters, with most likely a first cut in Q2/2024, as inflation is forecasted to cool down further. These expectations are reflected in the forward curve of the Euribor 3M, which represents at best what the market is currently incorporating in its price and therefore represents the base case of what the market assumes regarding future interest rate levels. The Euribor 3M forward curve reflects a decline in interest rates to 2.58% by the first quarter of 2027e, which will then converge again to 3.23% by the end of 2033e.⁶⁷ The spread is assumed to remain constant over the whole forecast period. Since NOS doesn't issue credit default swaps (CDS), it was calculated through the difference between the German Government Bond Yield Curve and the European Communication BBB- Index Yield Curve, as NOS has a credit rating of BBB- as well. Since most bonds have been issued with a five-year maturity, the spread has been considered on that periodicity, which equals 1.41%.⁶⁸ While they bear this risk also in the future, their price risk is limited, as even if some of the bonds are callable and puttable, only major interest rate changes in a catastrophe scenario could have a significant impact on the price of the floating-rate bonds. Some institutions have already developed worst-case scenarios that include a shock in energy prices. In some forecasts, this will result in up to three interest rate hikes by 2024.⁶⁹ Which in that very situation even if consecutive during the year, the assumption would be that those hikes

⁶⁴ (Chatham Financial 2023)

⁶⁵ (NOS SGPS, S.A 2023)

⁶⁶ (Bloomberg L.P 2023)

⁶⁷ (European Central Bank 2023)

⁶⁸ (Individual Part - Equity Valuation through uncertain monetary policy, Johann Lückehe 2023)

⁶⁹ (Rabobank S.A 2023)

would be separated into two or three 25 bps movements since the ECB would be careful on hiking further. Therefore, it is considered that puttable and callable options do not need to be factored into potential financial costs

5.4 Margin Evolution

Currently, NOS is in a strong position regarding its EBITDA margin, which is indicated by the comparison to its peers, as NOS outperforms them over the whole analyzed period (2023 Q3: 49.14% | peer median: 41.15%). As total costs are expected to increase slightly more than revenue on a year-on-year basis from 2027e, NOS's EBITDA margin is expected to fall slightly from 44.56% in 2023e to 43.4% in 2033e. The main drivers for the upward evolution of costs will be COGS and wages. Cost of goods sold will be driven by an increasing number of sales and the latter one is affected by inflation trends, as previously explained. However, in comparison to EBIT and Net Income, it is expected that EBITDA remains quite stable and remains higher than the historical medians of NOS's peer group. EBIT is affected by the investment cycle in the telecommunications industry and thus by depreciation and amortization, which was observable in the last cycle over the analyzed period, as NOS's EBIT margin reached its low point with 10.04% in 2020 (peer median: 17.58). As NOS already started decreasing its investments, its current EBIT margin (2023/Q3: 19.05% | peer median: 21.25%), is now again at the level of its competitors. Since NOS will further decrease its investments in the upcoming years and depreciation is expected to decrease, NOS's EBIT margin is forecasted to increase from 14.7% in 2023e to peak with 19.71% in 2030e. This effect will slowly be equalized when the industry is expected to invest in the next generation of technology with 6G, which is expected to happen after 2030e. Therefore it is assumed that the EBIT margin will reach lower territory with 17.69% in 2033e. While the net income margin rose in 2022 sharply due to extraordinary items (14.78%), it is expected to decrease in 2023e (9.23%), slightly below 2021 levels (9.91%), due to the recent spike in financial costs. As previously explained, financial costs are expected to remain on current levels of approx. € 65mn - € 70mn in the future, allowing the net income margin to rise further and peak in 2030e at 14.10%. However, as rates are forecasted to recover their heights from 2028e onwards and NOS will finance new investments from 2030e onwards, financial costs are expected to increase and the net income margin is forecasted to slightly decrease to 11.81% in 2033e. Compared to its peer group, NOS can be considered as well positioned, as current levels indicate (2023/Q3: 11.23% | peers: 9.45%). As already explained, the expected improvements could lead to an increase in the comparative advantage in the near future (approx. 4.50 percentage

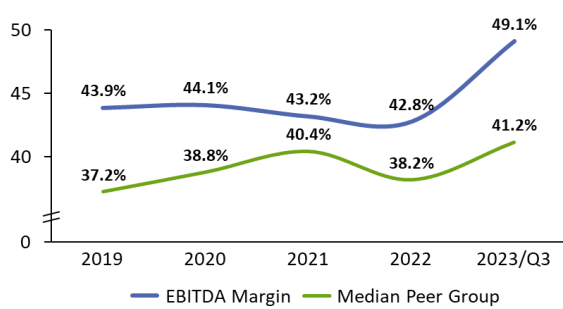


Figure 79: EBITDA Margin vs Median Peer Group [%]

Source: Group Analysis

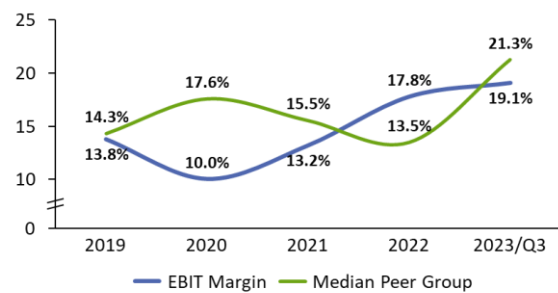


Figure 80: EBIT Margin vs Median Peer Group [%]

Source: Group Analysis

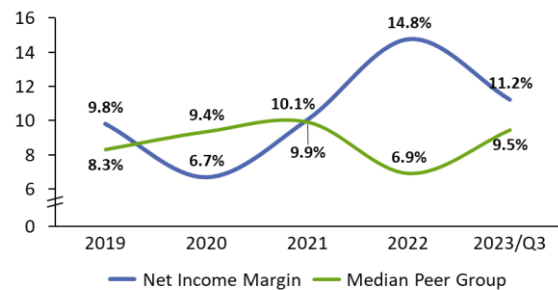


Figure 81: Net Income Margin vs Median Peer Group [%]

Source: Group Analysis

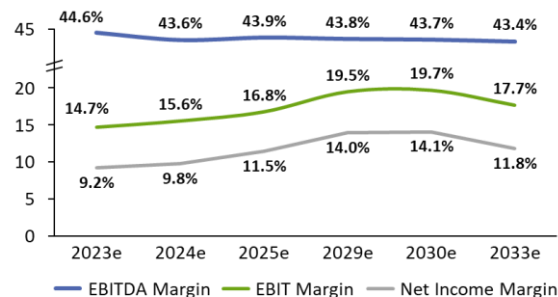


Figure 82: EBITDA, EBIT & Net Income Margin [%]

Source: Group Analysis

points between the peak value and the current level of the competition).

5.5 CapEx

As telecommunications is an investment-driven industry, CapEx is a relevant topic when it comes to preventing companies from stagnating. As mentioned in 5G Leadership (Chapter 1.4.1), NOS has undertaken huge investments in the expansion of its 5G and fiber network in the period from 2020 to 2022 in order to fulfil one of its strategic pillars, which is to become a 5G market leader. Broken down, it can be seen that technical CapEx, which consists of NW Exp, Subst, Integration & Other and Baseline, was always the predominant component of total CapEx compared with the remaining consumer CapEx, which consists of connection, SAC (Subscriber Acquisition Cost) and CPE (Customer Premise Equipment).

After the significant investments in the company's telecommunications segment, in 2023, due to the deceleration of 5G and FttH related CapEx, NOS has reached 90% coverage of the population with 5G and 70% FttH rollout, equivalent to 3.8mn homes passed. NOS has been decreasing its CapEx significantly, with further company guidance to target a total CapEx, excluding leases level of approximately € 400mn in 2023 as well as reaching a plateau of € 350mn from 2025 onwards. As of 2023/Q3 total CapEx excluding leases amounted to € 292.8mn, while including leases the number rose to € 358.9mn. Since the forecast is based on total CapEx while reflecting the company's guidance, the difference between the targeted figures after the lease and the total numbers can be considered as CapEx in Leasing Contracts & Other Contractual Rights. The development is in line with expectations regarding "rights of use", which are explained in more detail in the following section Depreciation & Amortization.

The current setup will allow the company to profit from past investments as well as solidify its positions as a leader. For forecasting purposes, it is supposed that NOS will not make investments of such magnitude in the next years, which is in line with the aforementioned company guidance. This forecast is driven by the assumption that each technological cycle lasts around ten years, allowing telecommunication companies to leverage on their investments in new technology, which is an adopted assumption, in line with NOS guidance. Hence, it is assumed that NOS will aim to maintain a leading position in the market from 2030, which according to the RSPG statement corresponds to the expected 6G timeframe and will invest in 6G technology on a similar magnitude as compared to their investment in 5G, as commercial

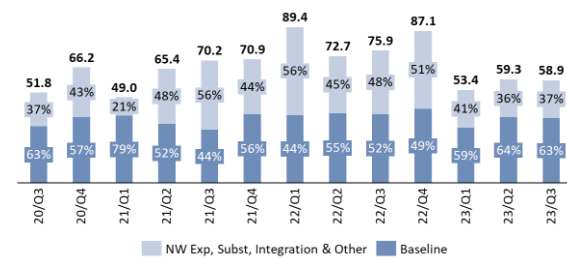


Figure 83: Technical CapEx Breakdown [€, mn]

Source: (NOS SGPS S.A 2023)

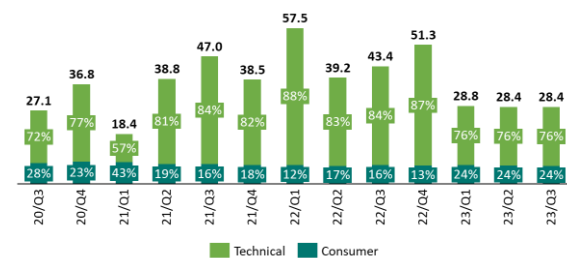


Figure 84: Technical vs. Consumer CapEx [€, mn]

Source: (NOS SGPS S.A 2023)

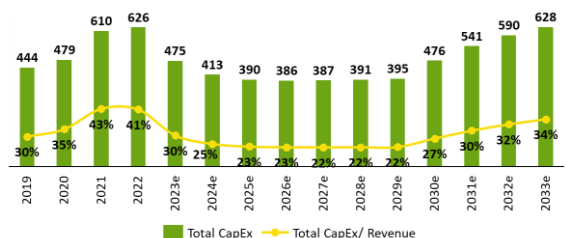


Figure 85: Total CapEx [€, mn]

Source: Group Analysis

Group Part

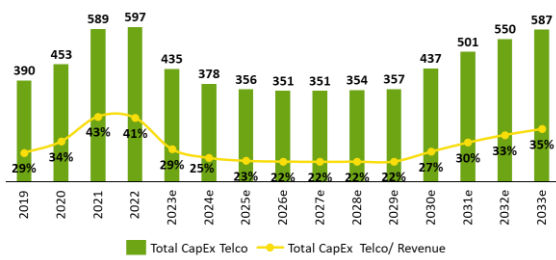


Figure 86: CapEx Telco [€, mn]

Source: Group Analysis

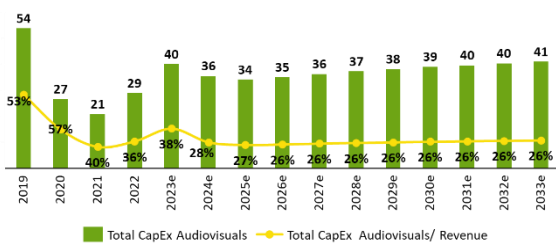


Figure 87: CapEx Audiovisuals [€, mn]

Source: Group Analysis

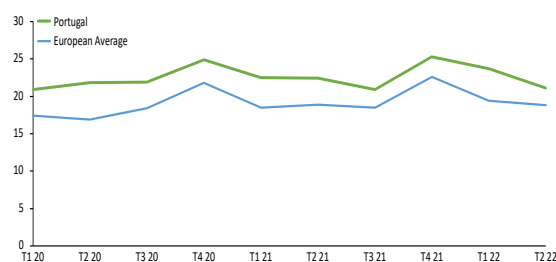


Figure 88: CapEx/Revenue Portugal vs. Europe

Source: (NOS SGPS, S.A 2023)

utilization/launch is predicted for 2030⁷⁰. While 6G is expected to be the primary part of their upcoming CapEx, other relevant technologies, such as those mentioned under the Industry Trends subsection, are also expected to be pursued.

Therefore, it is assumed that Telco CapEx over revenue will converge toward the Portuguese average of 22% until 2030.⁷¹ From 2030 onwards, a new wave of higher CapEx would follow due to investments in upgrading the network and/or implementation of new technologies as well as infrastructure. Hence, CapEx over revenue is expected to converge to an average from the historic period from 2020-2022 of 39.14% for the new technological renewal cycle to reflect the same investment pattern as for 5G. The Portuguese telecommunications market is leading in terms of significant and ongoing investments in innovative technology, surpassing the average levels observed across Europe. In order to fulfill its ambition of being a market leader and considering the nature of the industry, NOS itself has invested heavily to develop its 5G infrastructure and is expected to follow the same trend and ambition in 2030.

Audiovisual CapEx, on the other hand, is based on the historical evolution of total CapEx over revenue from the period 2019/Q1-2023/Q3 – excluding outliers – which amounts to 35.09%. In order to reflect the overall group CapEx strategy, it is expected that Audiovisuals CapEx will follow the trend started in the previous two quarters by decreasing CapEx drastically and converging to 26.5% (2023/Q2-2023/Q3 Average). The last two quarters are more representative, when compared to the past, considering the pandemic effect, or periods with extremely high in-demand movies, such as Barbie. The underlying assumption is that likely there won't be major fluctuations in the industry in the upcoming years. With new technologies, such as but not limited to Virtual Reality commercialization, the cinema industry will aim to integrate these in its business model, and thus remain competitive.

Overall, CapEx is forecasted to decrease until 2030, however, it is assumed that substantial CapEx will persist, although without fluctuation from the expected bounds, due to the further need to invest in customer acquisition, satellite capacity and network maintenance.⁷²

⁷⁰ (European Commission 2023)

⁷¹ (NOS SGPS, S.A 2023)

⁷² (S&P Global 2023)

5.6 Depreciation & Amortization

Depreciation and amortization for the Telco segment includes tangible assets, intangible assets, rights of use, and contract costs, while Audiovisuals depreciation is composed by the same, excluding contract costs. Accumulating these four assets, Group depreciation is forecasted to decrease until 2030 from € 470mn in 2023 (29.35% over revenue) to € 425mn (25.54% over revenue) and to start increasing from then onwards, in line with CapEx assumptions. As around 95% of NOS's invested capital is invested in its telecommunications business, the development of the assets of this business drives the asset evolution for the Group as a whole. Tangible assets for Telco include network and telecommunications infrastructure (fiber optic network and cabling, network equipment, and other equipment as well as terminal equipment installed on client premises). The main assumption taken regarding tangible assets reflects the assumptions for CapEx. More specifically, until 2030 NOS will not make as significant of investments as it did for the development of 5G and fiber networks, with growth reflected in the historic periods excluding high investment years of CapEx/revenue ratio in 2021 and 2022. In expectation, tangible assets will increase at a slower rate until 2030, as NOS will still maintain investments in terminal equipment and customer usage. From 2030 onwards, an increase in tangible assets is expected, following the assumption for total Telco CapEx, due to expected investments in 6G and other relevant technologies at the time, reflecting a growth rate similar to previous investments into 5G technology. Intangible assets mainly include frequency usage rights in 5G bands and other relevant bands. The following assumption regarding this asset line is that NOS will gradually amortize it, except for the period of the next 5G auction, which according to company guidance will likely occur in 2031. Contract costs represent commissions paid to third parties and customer loyalty contract-related costs. It is assumed that there will be a gradual decrease in these, partly due to the increase in sales via digital channels over time. Lease-related assets -rights of use - are assumed to grow based on their historical evolution, excluding the "sell and lease back-strategy" of share capital of NOS Towering SA. The sale of the towers to Cellnex in 2020 follows a 15-year lease period and therefore we assume, in line with the plan of NOS, that they will sell an additional smaller portfolio of towers to Cellnex in 2024 & 2026 and therefore their leaseings will increase marginally in relation to telecommunication towers and rooftops entry. In terms of rights of use, as Audiovisuals is a legacy business of NOS, it is expected for this asset line to slightly increase over the forecasted period, as the company will aim to maintain its position of relevance. Intangible assets include the acquisition of movies and series usage rights, expected as per „CFA Research Challenge – NOS Equity Valuation – A 5G Era Perspective; Enhancing Equity Valuation through Monte Carlo Simulations” 33

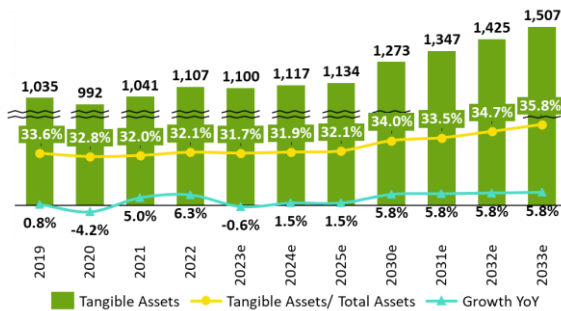


Figure 89: Tangible Assets [€, mn]

Source: Group Analysis

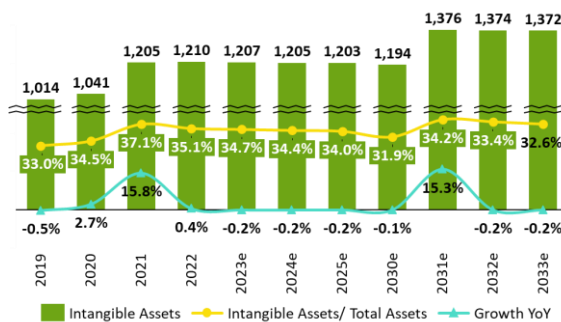


Figure 90: Intangible Assets [€, mn]

Source: Group Analysis

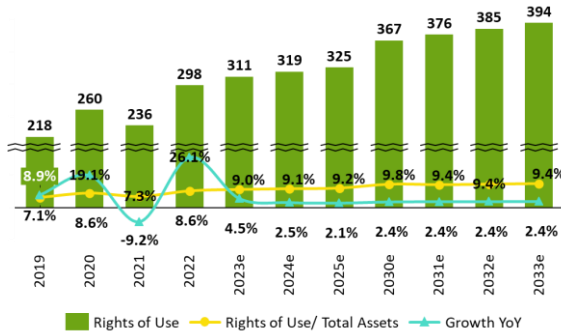


Figure 91: Rights of Use [€, mn]

Source: Group Analysis

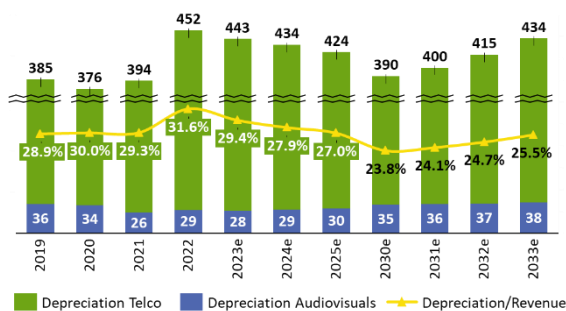


Figure 92: Depreciation [€, mn]

Source: Group Analysis

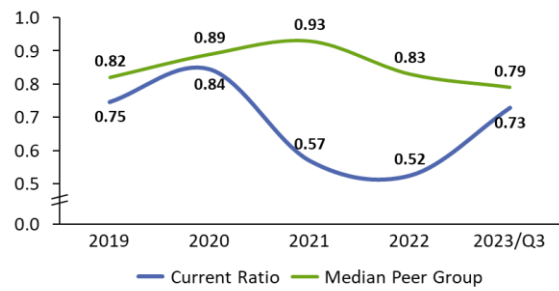


Figure 93: Current Ratio vs. Median Peer Group
Source: Group Analysis & Bloomberg

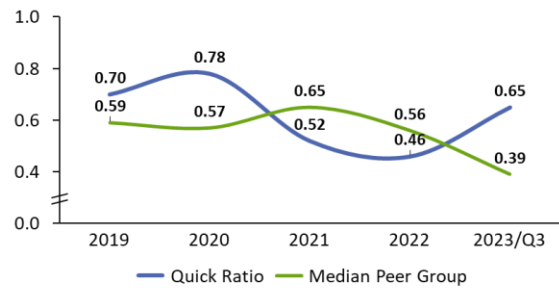


Figure 94: Quick Ratio vs. Median Peer Group
Source: Group Analysis & Bloomberg

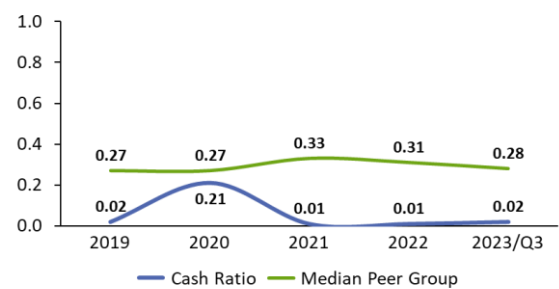


Figure 95: Cash Ratio vs. Median Peer Group
Source: Group Analysis & Bloomberg

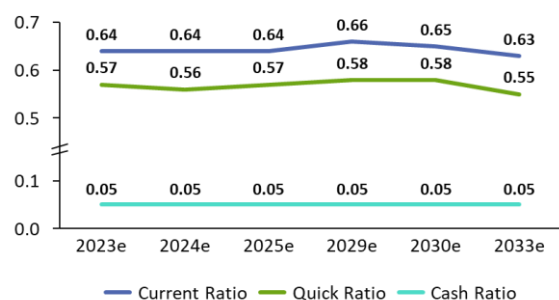


Figure 96: Forecast Current, Quick & Cash Ratio
Source: Group Analysis

group consensus to increase, following the described proposition for this business line. Tangible assets are forecasted to decrease based on past trends, as NOS is likely to invest more in a leasing approach.

5.7 Liquidity & Capital Structure

5.7.1 Liquidity

Historically, NOS's liquidity ratios (current, quick and cash ratio) have been lower than 1, which indicates that NOS would not be able to repay its current obligations through internal assets. Even if this might be the case for the industry, which is indicated through the similar pattern shown by the selected peer group.⁷³ After peaking in 2020, current and quick ratio fell, but seem to have stabilized now with values of 0.73 (current ratio | peer median: 0.79) and 0.65 (quick ratio | peer median: 0.39) in the recent quarter 2023/Q3 compared to their peers. The main drivers were a sharp decline in accounts receivables from 2019 to 2020 of -18.10% as well as a decline in prepaid expenses in the same period of -22.52%, which led to a spike in the cash ratio in that year of 0.21 – underlining the liquidity needs in the global pandemic. Afterwards quick and current ratios have been highly impacted by the high investments undertaken by NOS in 2020/2021, which led to an increase in current borrowings from € 143.3mn in 2019 to € 427.5mn in 2022, which equals a CAGR of 43.95%. While quick and current ratio stabilized through the rebound in accounts receivables, prepaid expenses as well as an increase in inventories and decline in current borrowings, NOS cash ratio remains a cause of concern. With the explained exception for 2020, it is historically almost zero (2023/Q3: 0.02) and lies significantly below the median of the peer group, which on average over the last five years was 0.29. Generally speaking, NOS operates historically with a constant negative level of working capital, meaning NOS would technically rely to fund their operations through external financing, respectively requires a constant investment in working capital to run their operations. However, due to their negative cash conversion cycle (CCC), NOS does not face pressure in terms of its liquidity situation – even if its CCC is less negative than the one from its peers (see figure 97) – NOS manages to finance part of their operations through their suppliers. In the forecast, since current assets and current liabilities are expected to grow at approximately the same rate, current and quick ratio are expected to increase marginally and peak in 2039e with 0.66 (current ratio) and 0.58 (quick ratio) until they slightly

⁷³ **Peer Group:** Vodafone Group Plc, Koninklijke KPN NV, Swisscom AG, Orange S.A, Telefonica S.A., Liberty Global Plc, Elisa OYJ, Telecom Italia AB, Hellenic Telecommun Organiza, Telekom Austria AG, Tele2 AB, Freenet AG, Digi Communications NV

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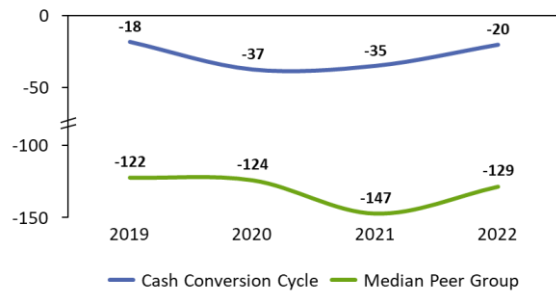


Figure 97: CCC vs. Median Peer Group [Days]

Source: Group Analysis & Bloomberg

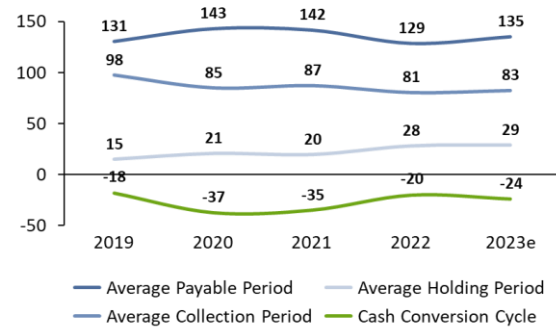


Figure 98: CCC Decomposition [Days]

Source: Group Analysis

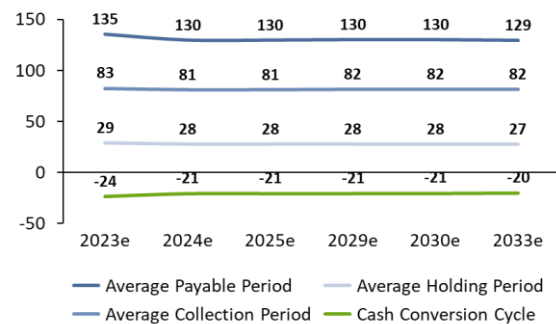


Figure 99: Forecast CCC [Days]

Source: Group Analysis

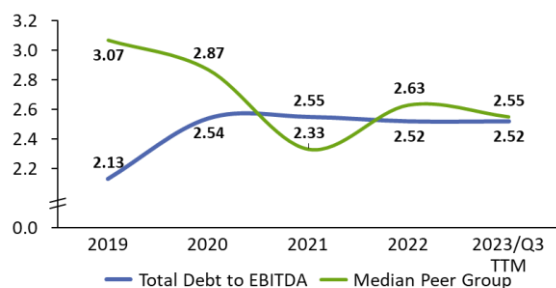


Figure 100: Total Debt to EBITDA vs. Median Peer Group

Source: Group Analysis & Bloomberg

decrease until 2033e with 0.63 (current ratio and 0.55 (quick ratio). The cash ratio is assumed to stay stable throughout the period with 0.05, while the CCC is expect to stabilize at -21 days, respectively -20 days in perpetuity.

5.7.2 Solvency

NOS financial health was highly impacted by the recent periods of high investments. Both D/E ratio and total debt/ EBITDA peaked in 2021 with 1.64 (peer median: 1.12) and 2.55 (peer median: 2.33) respectively, while the Interest Coverage Ratio decreased to 5.53 (peer median: 8.42). While NOS held their debt levels constant, their leverage increased again, which is visible comparing the current D/E (2023/Q3: 1.88 | peer median: 1.45) and total debt/ EBITDA (2023/Q3 TTM: 2.52 | peer median: 2.55). While those debt levels may not be not concerning, those numbers indicate that NOS operates with a higher leverage and therefore higher risks than competition. Moreover, they are facing more difficulties with the new level of interest rates compared to their peers, which is reflected by the current Interest Coverage Ratio (2023/Q3 TTM: 4.30 | peer median: 7.09). According to the last earnings call, NOS believes that they reached the plateau of future interest expense. A more conservative view is reflected in the forecast. Interest expenses are expected to more than double (2023e: €68.6mn) compared to the last year 2022 (€31.6mn) and peak in 2024, leading to an assumed low point in the Interest Coverage Ratio of 3.01 (2024e), which will afterwards stabilize around five before the new investment period begins. NOS gave clear guidance regarding their future debt levels, as they indicate that they feel comfortable around today's levels, and does not intend to stop refinancing maturing debt any time soon. Therefore, it is assumed that bonds that mature in the short-/ middle term are going to be replaced by new issuances. With EBITDA expected to increase in the future, it is assumed that total Debt/ EBITDA will therefore decrease slightly over time to 2.11 in 2029e, but might increase again to through the next wave of investments starting in 2030 and reach 2.44 at the beginning of the perpetuity in 2033e. Since their leverage is highly impacted by their dividend policy and the capability to generate internal equity (See *Intrinsic Valuation - DDM*), it is assumed that NOS's D/E ratio will moderately decrease over time and approach the peer median until the end of the forecast period (2033e: 1.43)

5.8 Shareholder Returns

Although NOS share price took a dive in the last five years and has not returned to pre-pandemic levels, NOS has been able to offset this negative share price performance with consistently high dividend payments, resulting to a total return on a five-year period of 1.81% (STOXX Europe 600 Telco: - „CFA Research Challenge – NOS Equity Valuation – A 5G Era Perspective; Enhancing Equity Valuation through Monte Carlo Simulations” 35

Group Part

1.33% | EuroStoxx Telco: 18.12%) and a current dividend yield of 8.18% - far above the peer median (5.74%)⁷⁴. Even if NOS share price performance doesn't mirror the following: except for 2020, NOS was able to generate value for its shareholders since its return on invested capital (ROIC) was always above its weighted average cost of capital (WACC).

The underlying drivers can be found by analyzing their operational margin (NOPLAT margin) and their operational turnover for each segment. The overall ROIC of the company follows the pattern of the Telco ROIC since approximately 94% of NOS's invested capital is invested in the Telco segment, which equals the contribution of this segment to the overall ROIC. While their operational turnover decreased slightly from 61.74% in 2019 to 56.91% in 2022 because of high investments, they were able to increase their operational margin in the same period from 10.90% to 15.27%. Although 2022 is not entirely representative, since their margin was boosted to the extraordinary tower sale to Cellnex, the underlying trend of cost control and efficiency gains remains intact and is expected to continue in the future. It is assumed that the operational margin will steadily increase until its peak in 2030e (16.43%) and afterwards slightly decline because of the new cycle of investments (2033e: 14.72%). The aforementioned investment cycle has also a high impact on the asset turnover, which lies in "non-investments"-times around 60%. This pattern is also reflected in the forecast, with a gradual increase in core asset turnover to 62.48% in 2029e. Afterwards, a decrease is expected, reaching 54.60% in 2033e. The audiovisuals business, on the other hand, was highly impacted by the pandemic, leading to negative costs in direct costs, marketing and advertising as well as supplies and external services in 2020 and 2021. Therefore, 2022 seems a more stable indicator for audiovisuals operational margin (21.05%) and asset turnover (55.35%). Both are forecasted to increase in the future through stable revenue inflows, cost reductions and less investment needs in that business. Until 2033e, it is expected that the audiovisuals core margin amounts 27.14% and its asset turnover 90.22%. Both business units together achieve an increase in NOS's overall group total ROIC from 2023e with 7.67%, spiking in 2029e with 11.00%, to 2033e (8.90%) and therefore generate value under the assumption of a constant WACC of 5.78% in the future. The spike and afterwards decrease in ROIC until reaching perpetuity can be explained by taking a closer look at RONIC (Figure 107) and connecting it with the investment cycle of the Telco business. Since new investments take a long time to become profitable,

⁷⁴ TR-Period: 06.11.2018-06.11.2023

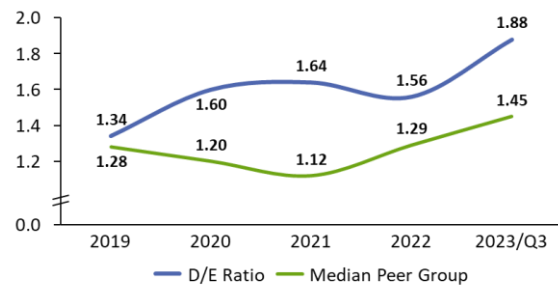


Figure 101: D/E Ratio vs. Median Peer Group
Source: Group Analysis & Bloomberg

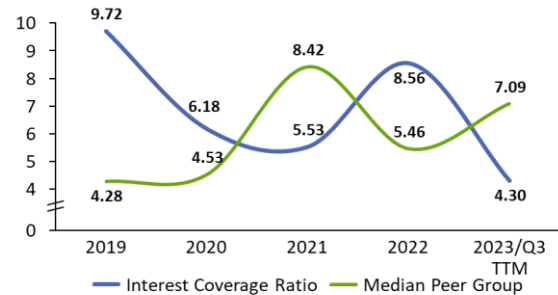


Figure 102: Interest Coverage Ratio vs. Median Peer Group
Source: Group Analysis & Bloomberg

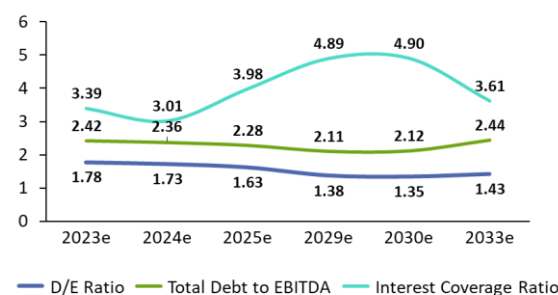


Figure 103: Forecast D/E Ratio, Total Debt to EBITDA & Interest Coverage Ratio
Source: Group Analysis

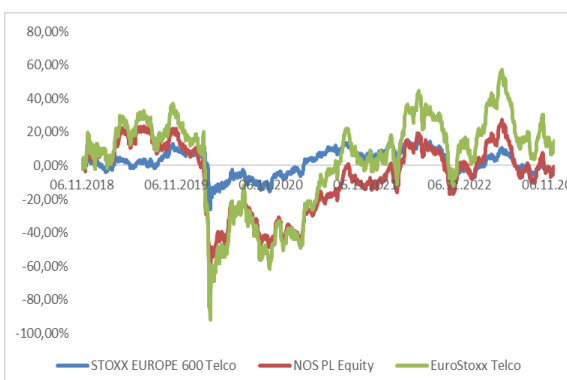


Figure 104: Total Return vs. Benchmarks [%]
Source: Group Analysis & Bloomberg

Group Part

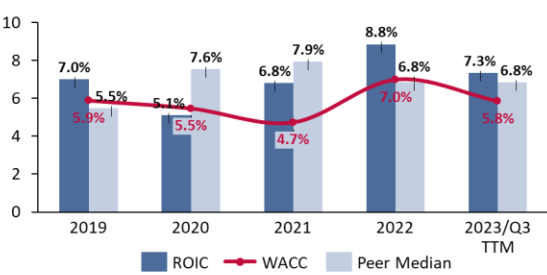


Figure 105: ROIC vs. WACC vs. Peer Median [%]
Source: Group Analysis & Bloomberg

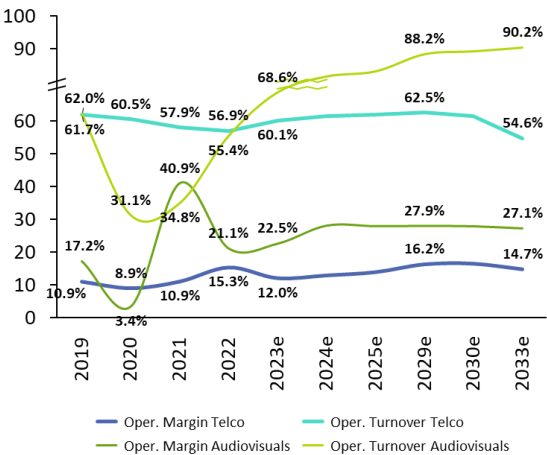


Figure 106: Operating Margin & Turnover [%]
Source: Group Analysis

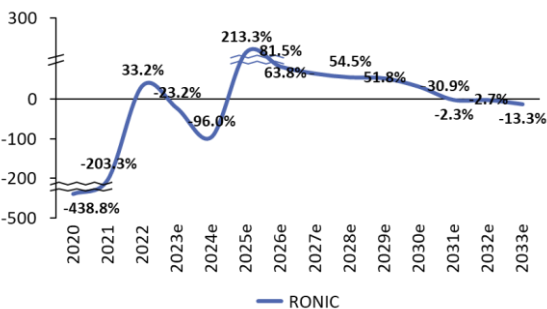


Figure 107: RONIC Historical Evolution & Forecast [%]
Source: Group Analysis

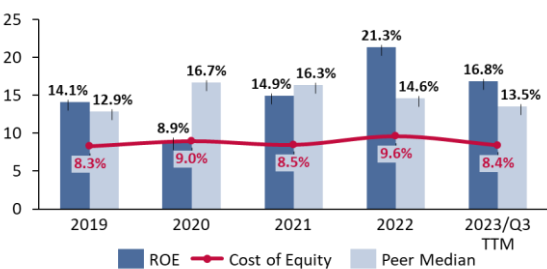


Figure 108: ROE vs. Cost of Equity vs. Peer Median [%]
Source: Group Analysis & Bloomberg

RONIC remains negative in 2023e, until it becomes positive and pushing up ROIC. At the beginning of the aforementioned investment cycle, RONIC turns negative again, bringing down ROIC as well to the explained levels above. Moreover, NOS was able to deliver a higher return on equity (ROE) as well as a higher return on assets (ROA) in the recent periods compared to its peers. While 2022 ROE (21.33% | peers: 14.58%) and ROA (6.51% | peers: 6.15%) might be highly impacted by the tower sell to Cellnex, their upward trends since 2020 remains intact, indicated by a current ROE (2023/Q3 TTM: 16.8% | 2023e: 15.27%) vs. peers (2023/Q3 TTM: 13.51%) and current ROA (2023/Q3 TTM: 4.58% | 2023e: 4.26%) vs. peers (2023/Q3 TTM: 4.47%). NOS's ROE is forecasted to increase in the upcoming years to peak in 2029 at 20.88%, while afterwards slightly decrease to today's levels with 15.95% in 2033 because of the new investment cycle beginning in 2030, while ROA is expected to peak at 6.73% in 2029 and converge to 5.18% at the end of the of forecast period.

5.9 WACC

5.9.1 Cost of Debt

In order to determine the most accurate Cost of Debt for NOS, several approaches have been considered to estimate the average yield to maturity (YTM) of NOS outstanding debt, the annualized default probability, and the implied loss given default.⁷⁵⁷⁶ As of September 2023, NOS has eight bonds with a total amount of € 415mn issued, which YTM's are not observable in the market. To estimate their average YTM, three approaches have been considered to calculate a spread, which has been added to the Portuguese Government Bond Yield Curve. Since, NOS doesn't issue credit default swaps (CDS), other measures have been taken into consideration. First, a market spread has been calculated between the German Government Bond Yield Curve and the European Communication BBB- Index Yield Curve. Secondly, two synthetic spreads have been estimated by applying NOS current credit rating from S&P (BBB-) and their TTM Interest Coverage Ratio on historical default spread tables based on both measures. Since both measures led to high discrepancies (Interest Coverage Ratio Spread: 142bp | Credit Rating Spread: 235bp), the market approach was considered to be the most accurate and forward-looking.

To obtain the YTM for each bond, linear interpolation has been used based

⁷⁵ All market data refer to the valuation date of 6th November 2023

⁷⁶ See Appendix 8-11

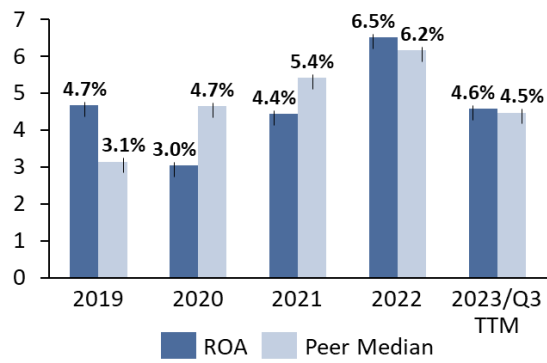


Figure 109: ROA vs. Peer Median [%]
Source: Group Analysis & Bloomberg

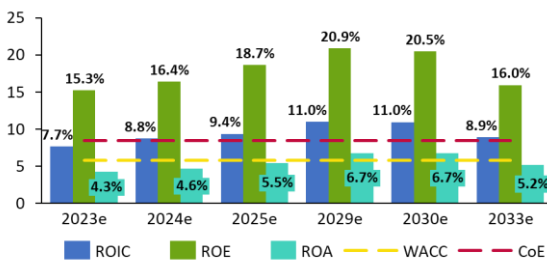


Figure 110: ROIC, ROE, ROA vs. WACC & CoE Forecast [%]
Source: Group Analysis & Bloomberg

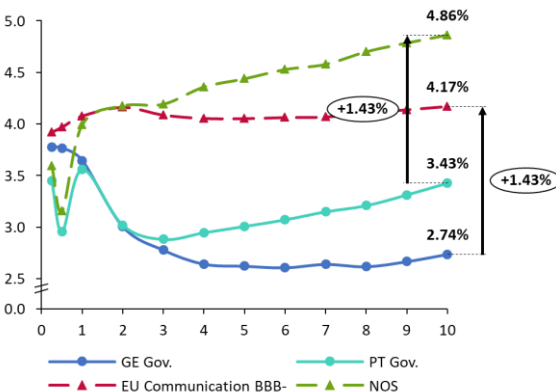


Figure 111: Yield Curves [% per Maturity in Years]
Source: Group Analysis & Bloomberg

on the new yield curve ("Portuguese Government Bond + Market Spread") according to the respective maturity of each bond. To obtain the average maturity and average YTM of NOS outstanding bonds, each notional has been discounted by the calculated YTM according to each bond's maturity. Afterward, the respective YTMs and maturities have been weighted according to the present value of NOS's outstanding debt. This led to an average YTM of 4.00% and an average maturity of 2.75 years, which matches the number given by NOS in their recently published management report 2023/Q3.⁷⁷ The average maturity has been used to calculate annualized default probabilities based on global corporate average cumulative default rates for different credit ratings from 1981-2021 according to different measures: Altman Z' Score (13.16%), S&P Credit Rating (0.23%), Interest Coverage Ratio (0.07%), Bloomberg Market Value (7.52%). Given the fact that the Interest Coverage Ratio seems to underestimate, while Altman Z' Score and the Bloomberg Market Value overestimate the default probability of NOS, a more conservative view has been taken with proceeding with the default probability according to the S&P credit rating. The implied loss given default has been taken from Bloomberg (61.6%) to finally derive at a Cost of Debt of 3.85%, which is in line with NOS latest reported number of 3.90%.⁷⁸

5.9.2 Market Risk Premium & Cost of Equity

In order to evaluate the most accurate WACC of NOS, several approaches were considered to calculate the total market risk premium.⁷⁹ The total market risk premium consists of a market risk premium for mature equity markets (MRP) and a country risk premium (CRP). To calculate the MRP, two approaches have been evaluated based on the STOXX Europe 600 Index. The first one equals the annualized total return over the last ten years (4.02%), while the second approach equals the implied MRP taking estimates for future earnings and dividends per share into account as well as the current share price (4.78%). The implied MRP thus corresponds to the implicit discount factor, which was derived on the basis of the given earnings and dividend per share estimates as well as the last close price on the valuation date. Since the second approach is more forward-looking and more appropriate taking long-term stock market returns into account, the Implied MRP approach has been chosen. Regarding the CRP, again, several approaches have been considered based on default spreads (synthetic and market approach), equity

⁷⁷ (NOS SGPS, S.A 2023)

⁷⁸ (NOS SGPS, S.A 2023)

⁷⁹ See Appendix: 12-14

Group Part

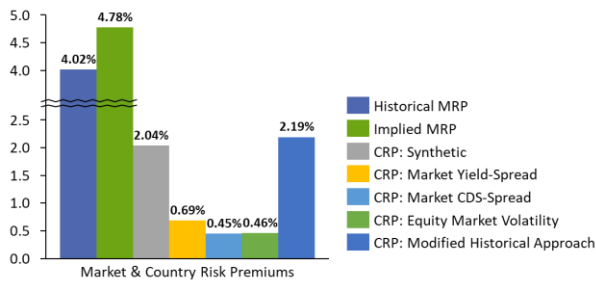


Figure 112: Market & Country Risk Premiums [%]
Source: Group Analysis & Bloomberg

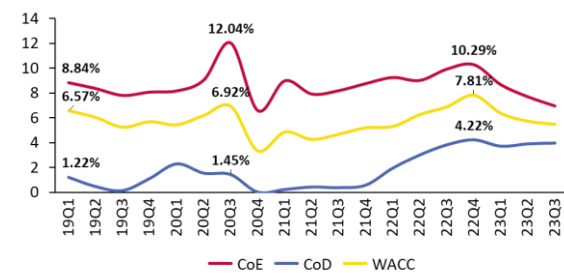


Figure 113: Cost of Equity, Cost of Debt and WACC Evolution [%]
Source: Group Analysis & Bloomberg

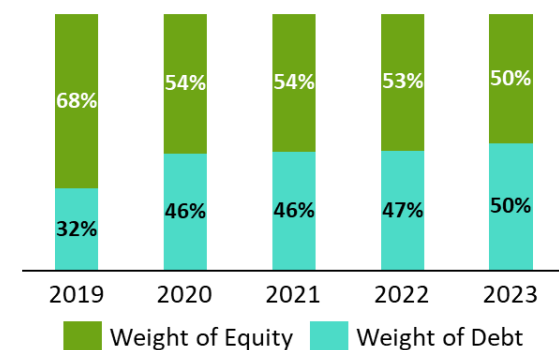


Figure 114: Capital Structure Evolution [%]
Source: Group Analysis & Bloomberg

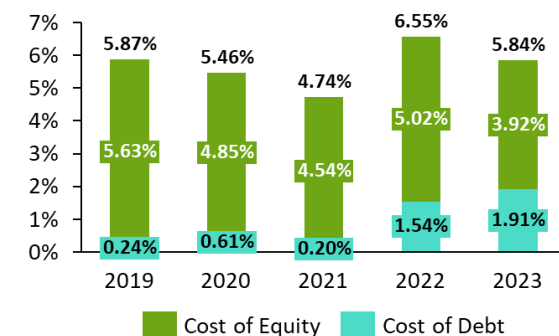


Figure 115: Weighted contributions to WACC [%]
Source: Group Analysis & Bloomberg

market volatility and modified historical premium.⁸⁰ The market approach for the CRP based on default spreads equals the spread between CDS or government yields of Germany and Portugal, both for maturities of ten years (CDS Default Spread: 0.45% | Bond Default Spread: 0.69%). The CRP based on equity market volatility reflects the higher volatility of the PSI20 compared to the STOXX Europe 600 in the last ten years (CRP: 0.46%). The CRP based on a modified historical premium multiplies the previously defined bond default spread with the volatility of the PSI20 over the volatility of the Portuguese Government Bond with a maturity of ten years, both on a ten year period. As no such long price history was available for the latter, a proxy (iShares EUR Government Bond 7-10Y ETF) was used to obtain a CRP of 2.19%. For further calculations, the most academic approach – the synthetic default spread – was assumed, leading to a CRP of 2.04% for Portugal.⁸¹ For 80 countries, CDS spreads have been measured at the beginning of the year. Those spreads have been averaged according to their credit rating to conduct a CDS spread for each credit rating. Those spreads have been updated by multiplying the initial CDS spread per rating times the median of the half-year changes for each of these 80 countries. The total MRP was multiplied by the beta of NOS of 0.84 in order to determine the cost of equity of NOS and ultimately the WACC. To obtain this, a peer group was constructed and their betas relative to the STOXX Europe 600 were extracted from Bloomberg⁸². NOS Beta was obtained on the basis of the unlevered beta of the peer group (median) as well as the forecast of NOS D/E ratio at the end of the forecast period in 2033. Finally, the valuation is based on a WACC of 5.78% based on an implied MRP, which has been adjusted by a synthetic CRP. This WACC estimate is slightly lower than the average WACC of the last five years (2018-2023/Q3: 5.99%), which can be explained by the changes in the capital structure of NOS. While the recent spike in rates drove up CoD, the overall increase of debt and therefore reduced weight of the higher CoE, led to a decrease in WACC. Moreover, a lower MRP due to higher yields as well as a cloudier outlook for the European economy, which is reflected in the earnings and dividend estimates for the mentioned Index, further influenced this development. Still, a more conservative view is taken in the forecast, since the WACC is estimate is higher than the current WACC of 5.47% (2023/Q3) published by Bloomberg.

⁸⁰ (Damodaran 2023)

⁸¹ (Damodaran 2023)

⁸² **Peer Group:** Vodafone Group Plc, Koninklijke KPN NV, Swisscom AG, Orange S.A, Telefonica S.A., Liberty Global Plc, Elisa OYJ, Telecom Italia Spa, Hellenic Telecommun Organiza, Telekom Austria AG, Tele2 AB, Freenet AG, Digi Communications NV – BT Group & Proximus NV

6 Valuation

Valuation Method	Price	Weight
Discounted Cash Flows	4.18 €	50%
Dividend Discount Model	4.04 €	30%
Peers Multiples	3.91 €	15%
Transaction Multiples	5.84 €	5%

NOS SGPS Target Price	4.18 €
Current Share Price	3.51 €
Premium / (Discount)	19.07%

Figure 116: Overview Valuation Methods and Target Price

Source: Group Analysis

The valuation methods conducted to value NOS SGPS were an Intrinsic Valuation through a DCF, a DDM and Relative Valuation, using Trading Multiples of Peers and Past Transaction Multiples (Figure 116). NOS's weighted average price target is €4.18, which is 19.07% above NOS price of €3.51 as of 06th November 2023. Furthermore, a Sensitivity Analysis was conducted to assess the DCF Valuation results better. It should be noted that, to ensure a correct comparison, all data was extracted from Refinitiv or Bloomberg based on the 06th of November, if not stated otherwise.

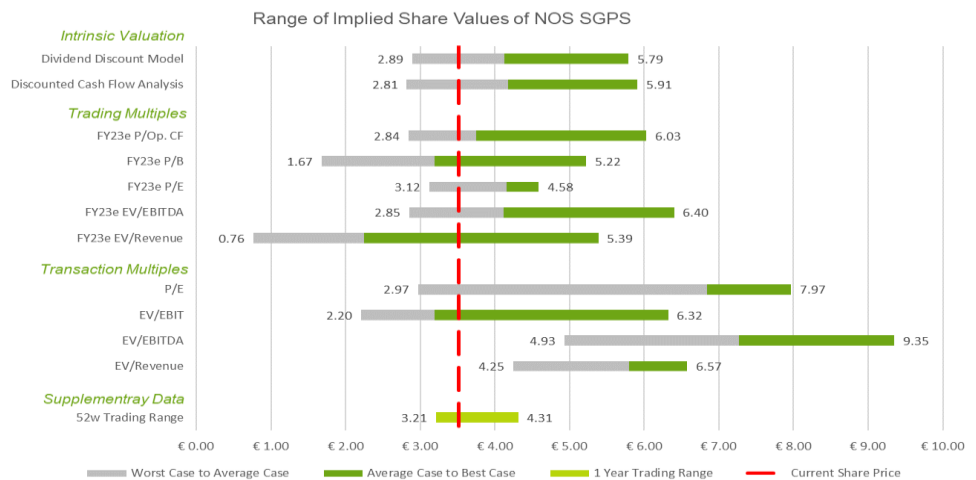


Figure 117: Football Field all Valuation Methods [€]

Source: Group Analysis

6.1 Intrinsic Valuation – DCF

In the Telecommunication segment, NOS is presented as a company in a mature stage until the end of 2029 with an increase in FCFF to €302mn, profiting from its investments in 5G frequency rights in the prior years. From 2030 onwards, FCFFs will decline to slightly below €100mn in 2033 (Figure°119). This leads to a CAGR of -10.46% over the period from 2024 to 2033. Although NOPLAT is expected to increase at a CAGR of 2.59% until 2033 (€199mn in 2024 and €250mn in 2033), the substantial decrease at the end of the projection period happens due to expected investments in new frequency rights, as described in more detail in “CapEx”. It is causing CapEx to increase to €586mn in 2033 from €357mn in 2029. If, instead, the period prior to the new investments, meaning 2024 to 2029, is considered a CAGR of 2.34% of FCFFs is expected. Although a negative growth in FCFFs is expected towards the end of the estimation period, this does not mean that NOS is not likely to grow in the future. Rather, the opposite, as investments in new technology are necessary to continue growing. Based on that and the fact „CFA Research Challenge – NOS Equity Valuation – A 5G Era Perspective; Enhancing Equity Valuation through Monte Carlo Simulations” 40

Telco	CAGR	CAGR 2023 - 2029
Revenue	1.06%	1.09%
EBITDA	0.96%	1.11%
- D&A	-0.01%	-2.05%
- Income Taxes	2.71%	6.45%
- Tax adjustments	1.87%	2.37%
NOPLAT	2.59%	5.92%
- CAPEX	5.02%	-1.10%
NWC	1.89%	1.99%
- Δ in NWC	-18.84%	-28.59%
addback: D&A	-0.01%	-2.05%
FCFF	-10.46%	2.34%

Figure 118: CAGRs Telecommunication

Source: Group Analysis

Group Part

that the telecommunication market in Portugal is highly saturated, a rather conservative estimate of 1% for the terminal growth rate was considered. This is further justified by the revenues growing at a CAGR of 1.06%.

The Audiovisual segment contributes significantly less to the revenue and FCFFs than the Telco segment. It is expected to continue growing from its current levels, surpassing its 2019 highs, although its growth potential is limited. There is an ongoing demand for Cinemas, especially in the premium segments like IMAX. FCFFs are expected to grow from €29.5mn in 2024 to €37.7mn in 2033, representing a CAGR of 2.74%. During the period, it is anticipated that CapEx will increase from €35.5mn to €41mn per year, representing a CAGR of 1.61%, which is slightly below the FCFF's CAGR. The terminal growth rate for the Audiovisual segment was determined by the long-term inflation forecast of Portugal and the company's long-term guidance, resulting in a growth rate of 2%. This is in line with our revenue estimation, which is growing at a CAGR of 2.44%, and our FCFF estimation.

Further, it is noted that the expected increase in investments will also lead to an increase in debt. Since the investments in frequency rights in the last auction process in 2019/2020 were mainly financed through debt, which is expected to be repeated in the future. Therefore, we estimate that NOS will not raise its capital in the future. Accordingly, this has an impact on the WACC, which we assume to be at 5.78%. The calculated WACC is higher than the Bloomberg estimate of 5.47% for Q3 2023 but slightly below the 5-year average of 5.69% from 2019 to Q3 2023, which indicates a rather conservative view of our valuation. The assumptions to calculate the WACC are described in more detail in the section "WACC". Overall, the DCF Valuation resulted in an implied share price of NOS of €4.18, representing an upside potential of 19.04%. Since the DCF valuation considers future expectations based on specific sophisticated assumptions, it better captures NOS's competitive advantage and strategy. We therefore attributed a weight of 50% for the weighted average price target.

6.1.1 Sensitivity Analysis

To complement the DCF valuation further, a sensitivity analysis was performed to assess the impact of changes in the two key variables, WACC and growth rate, on the share price. The two parameters were chosen, given firstly, their uncertainty and, secondly, their impact on the valuation output. The growth rates and the WACC were subject to positive and negative changes of 0.5% in every step. The starting point of each variable was based on its initial assumption (Telco growth: 1.00%, Audiovisuals growth: 2.00%, and WACC: 5.65%). The relatively high terminal growth rates of 2.5% for „CFA Research Challenge – NOS Equity Valuation – A 5G Era Perspective; Enhancing Equity Valuation through Monte Carlo Simulations” 41

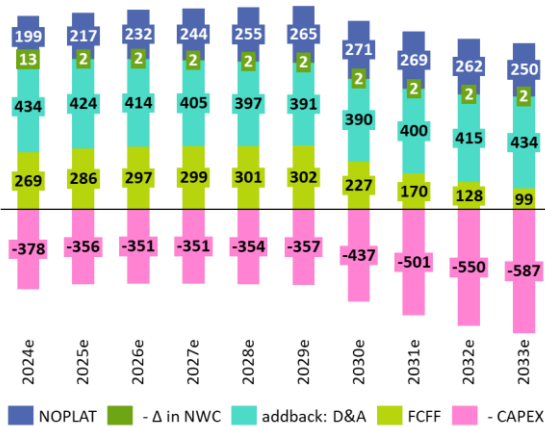


Figure 119: FCFF Calculation 2024e-2033e [€, mn]

Source: Group Analysis

b.) Implied Market Risk Premium - STOXX Europe 600:	
Current Price	443.52
Growth Rate in Earnings per Share Estimate	2.91%
EPS Current	37.84
EPS Estimate 12M+2Y	41.24
Dividend per Share Estimate 12M+2Y	20.44
Implied Required Market Return (RoE)	7.52%
Risk Premium: Market	4.78%
Risk Premium: Country	2.04%
Risk Premium: Total	6.82%
Risk-free rate: 10Y Bund-Yield	2.74%
Equity Beta	0.84
Cost of Equity	8.48%
Cost of Debt	3.85%
Total Debt	1,775,202
Total Equity	1,795,102
Tax Rate	21.00%
WACC	5.78%

Figure 120: WACC "Implied Market Risk Premium"

Source: Group Analysis & Bloomberg

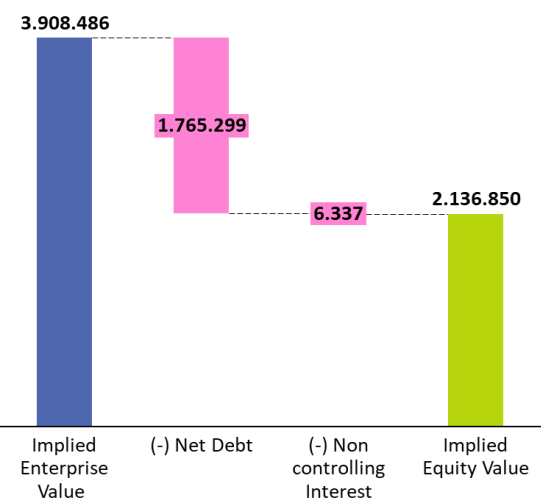


Figure 121: DCF Waterfall Implied Enterprise Value to Implied Equity Value [€, thousands]

Source: Group Analysis

Group Part

Telco and 3.5% for Audiovisuals in the sensitivity were included since NOS is currently showing strong year-over-year growth of above 5% in 2022 and 9% in 2023. Also, the WACC was tested to a range from 3.65% to 8.15% since the highest WACC during the observation period was 7.82% in Q3 2018, and the lowest was 4.25% in Q2 2021. As observable in Figure 122, the prices of NOS's share range from a minimum of €1.68 (Telco Growth: -1.00%, Audiovisuals Growth: 0.00%, WACC: 8.15%) and a maximum of €48.29 (Telco Growth: 2.5%, Audiovisuals Growth: 3.5%, WACC: 3.65%). The extensive price range emerges due to eight changes in the WACC and seven changes in the growth rate, providing a broad overview.

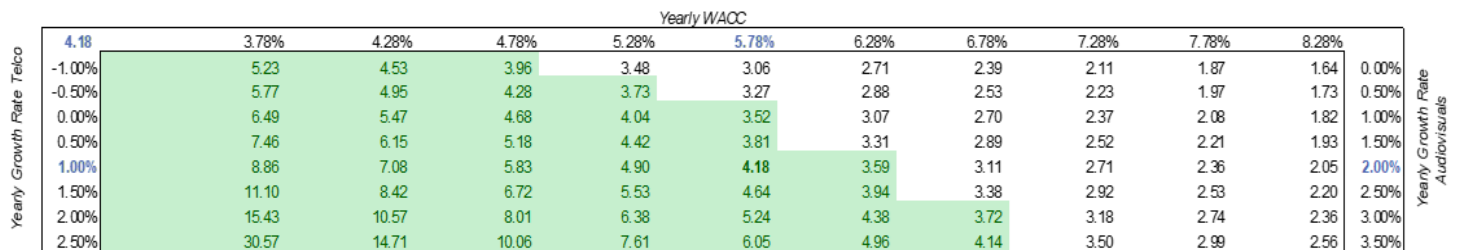


Figure 122: Implied Share Price Sensitivity Analysis to Changes in Growth Rate and WACC

Source: Group Analysis

6.2 Intrinsic Valuation - DDM⁸³

The dividend discount model obtained results in an implied share price of €4.04 in the base case, representing an upside of 15.13%. This valuation method considers payout ratios, found to be optimal for NOS, in order to maintain a sustainable approach and satisfy shareholders. The optimal strategy was obtained by applying Solver under the following conditions: Dividends cannot be greater than net income and forecasted equity free cash flow for the previous period respectively. Furthermore, it is assumed that the DPS in 2023e will equal the current DPS in 2022 (€ 0.278), which has been maintained for the past years by NOS, excluding an extraordinary dividend paid in 2022 due to the sale of towers to Cellnex. For 2023e the applied payout ratio is 96%. From 2024 until 2027 a stable payout ratio of 91% is assumed since NOS won't invest on such a high scale as in the past until 2030. From 2028, a target DPS, equal to the previous one of 2027 is implemented to maximize shareholders' profit while adopting a more conservative view taking the upcoming assumed new wave of high investments into account. Even though NOS states that it does not follow a dividend policy, it can be assumed that NOS will follow the same pattern as in the period from 2019 to 2022 and maintain a constant DPS for several years, which are characterized by high investments. For the last forecasted period, this DPS cannot be held because

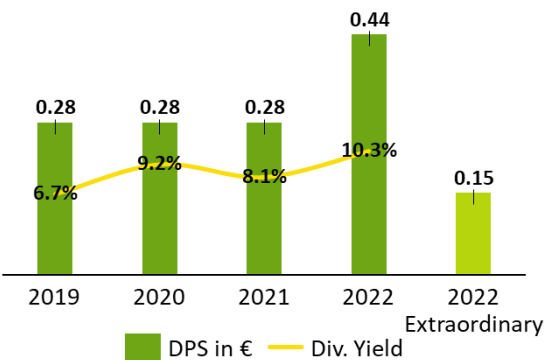


Figure 123: Historical DPS [€] & Div. Yield [%]

Source: NOS SGPS SA

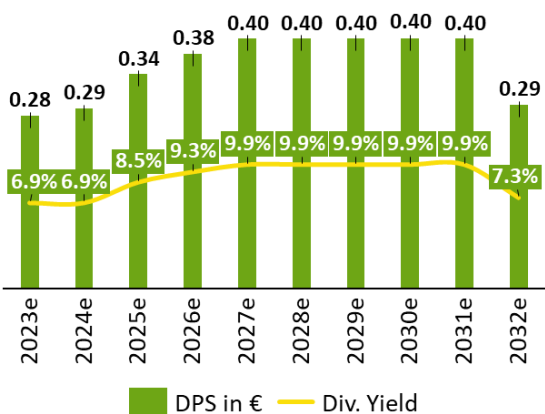


Figure 124: Forecast DPS [€] & Div. Yield [%]

Source: Individual Part Boriana Radivoeva

⁸³ Source: Individual part Sustainable Dividend Policy, Boriana Radivoeva

Group Part

of the aforementioned investments with the beginning of the new technological renewal cycle, hence it is assumed that there is a decline in DPS to €0.2945 and a payout ratio of 65% to maintain a sustainable dividend policy. Since the DDM valuation considers future expectations based on specific assumptions and NOS is expected to return substantial value to its shareholders through dividends, the method is viewed as a relevant measure. We therefore attributed a weight of 30% for the weighted average price target.

7 Relative Valuation

7.1.1 Trading Multiples Peers

To assess NOS SGPS value based on trading multiples of the industry, an eligible peer group was selected. Since most of the identified competitors in the “Competitive Positioning” part are listed privately (MEO, Nowo, Lycamobile), the comparable group was extended by industry peers with similar characteristics to NOS. The evaluation was based on the following aspects:

Business model: The company needs to have a similar business model as NOS and thus a similar client group. This means to perceive its revenue mainly from telecommunication service operations, which accounts for 85% of NOS’s revenue. This led to the exclusion of telecommunication infrastructure providers like Infrastrutture Wireless Italiane, Eutelsat Communications and Cellnex Telecom SA or access to cloud storage providers like United Internet⁸⁴ AG.

Geographical reach: The company needs to generate its revenue in the EU area or if operating abroad only in similar markets to Portugal like South American countries. This, for example led to the exclusion of BT Group (main operations in UK), Telenor ASA (40% of revenue from Asian countries) or Proximus (33% from non EU Countries). It is noted that companies from Nordic countries are included due to the similarity in the telecommunication markets in regards to 5G population coverage, penetration rate, and a very similar increase in prices since 2009, according to Anacom⁸⁴.

Market Capitalization: The company needs to be in a range of market capitalization of €500mn – €35bn. Resulting in the exclusion of companies like Deutsche Telekom, which are too large to be compared with.

⁸⁴ (ANACOM 2023)

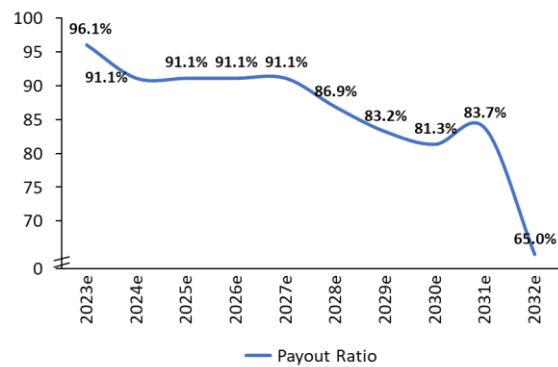


Figure 125: Payout Ratio Forecast [%]

Source: Individual Part Boriana Radivoeva

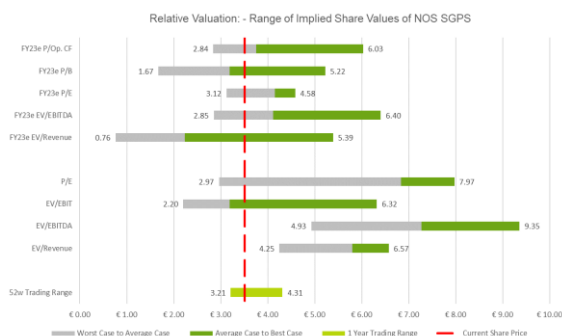


Figure 126: Football Field Relative Valuation [€]

Source: Group Analysis

Group Part

In a first step, a broad peer group of around 30 companies was selected and then funneled down based on the above-mentioned characteristics. This resulted in a final peer group for the CCA and peer comparison of a total of 14 companies (Figure 127).

Company	Country based	Market Capitalization (€)	Segment repartition Telecom	Geographic repartition Europe
Swisscom AG	Switzerland	27'730'320.15	96%	100%
Orange SA	France	29'526'628.25	95%	100%
Vodafone Group	United Kingdom	24'593'372.47	99%	100%
Telefonica SA	Spain	21'420'456.59	100%	80%
Koninklijke KPN	Netherlands	12'592'262.72	95%	100%
Elisa OYJ	Finland	7'046'479.92	100%	98%
Telia Company AB	Sweden	8'279'206.56	>90%	100%
Liberty Global PLC	United Kingdom	6'019'342.33	100%	100%
Telecom Italia SPA	Italy	5'360'671.81	100%	75%
Hellenic Telecommunications Organization	Greece	5'916'315.95	89%	100%
Telekom Austria	Austria	4'485'375.00	100%	100%
TELE2 AB	Sweden	4'860'961.24	100%	100%
Freenet AG	Germany	2'910'686.64	88%	99%
Digi Communications NV	Romania	781'636.54	100%	100%
NOS	Portugal	1'808'216.44	95%	100%

Figure 127: Overview Peers Relative Valuation

Source: Group Analysis

To represent a wide range of valuation possibilities, five different multiples, which suit the telecommunications sector, were used:

- ↳ Enterprise Value/Revenue
- ↳ Enterprise Value/EBITDA
- ↳ Price/Earnings Ratio
- ↳ Price to Book
- ↳ Price to Operating Cashflow

Multiple	Weights
EV/Revenue 2023	5%
EV/EBITDA 2023	45%
P/E 2023	30%
P/B 2023	10%
P/Op. CF 2023	10%

Scenario	realistic
Implied Share Price (€)	3.91
Current Share Price (€)	3.51
Premium / (Discount)	11.26%

Figure 128: Implied Share Price Trading Multiples Peers

Source: Group Analysis

To gain a deeper insight into the multiple valuation and compare it with estimates, the values for FY22, FY23E and FY24E were received. To be constant, the numbers used to calculate the Implied Equity Value from the Implied Enterprise Value are from the NOS Balance Sheet and are the same as in the DCF. Each dataset of the multiples was split into a Minimum, 25th Percentile, Median, 75th Percentile, and Maximum distribution, which resulted in a range of valuation multiples. With the multiplication of NOS's operating metrics and adjustments for the Equity Value, an implied range of Share Values was received (Figure 129). Following the computation, different weights were distributed on the implied share prices of the 23E multiples. In the realistic scenario (Median), the Multiple Valuation results in an implied share price of €3.91 (Figure 128), which represents a Premium of 11.26%. The pessimistic scenario (25th percentile) leads to an implied share price of €2.71 (Discount of -22.82%), and the optimistic scenario (75th percentile)

Group Part

leads to an implied share price of €5.65 (Premium of 61.00%).

NOS SGPS - Comparable Companies		NOS - Implied Range of Share Value				
Current Share Price (€)	3.51					
Valuation Date	06/11/2023					
Scenario	realistic	Minimum	pessimistic 25th Perc.	realistic Median	optimistic 75th Perc.	Maximum
Multiple						
EV/Revenue	2022	0.41	0.72	2.05	4.91	8.09
	2023	0.41	0.76	2.24	5.39	8.30
	2024	0.26	0.83	2.31	5.46	8.27
EV/EBITDA	2022	0.28	1.14	1.85	4.32	8.75
	2023	1.38	2.85	4.12	6.40	11.56
	2024	1.38	2.85	4.11	6.30	11.42
P/E	2022	0.85	4.02	5.83	7.60	16.08
	2023	2.02	3.12	4.15	4.58	5.09
	2024	2.00	3.03	3.74	4.47	7.41
P/B	2022	0.52	1.68	2.75	4.96	11.08
	2023	0.62	1.67	3.19	5.22	10.45
	2024	0.60	1.73	3.40	5.51	10.67
P/Op. CF	2022	1.37	2.42	4.04	8.05	14.85
	2023	1.55	2.84	3.75	6.03	12.02
	2024	1.47	2.46	3.51	5.98	11.91

Figure 129: Implied Range of Share Values Trading Multiples Peers

Source: Group Analysis

7.1.2 Transaction Multiples

When assessing NOS SGPS value based on transaction multiples, eligible transactions of companies similar to NOS needed to be identified. The data of the historical M&A Activity was retrieved from Mergermarket on the 9th of September 2023 with a total of 1239 transactions. Based on that, it can be stated that a lot of M&A Activity has occurred in the Telecommunications Sector in Europe since 2018. The transactions were then narrowed down to a total of 8 eligible transactions (Figure 131) based on different characteristics, which are observable in Figure 130. Similar to the comparable Analysis, several multiples were taken into account. This includes EV/Revenue, EV/EBITDA, EV/EBIT and P/E. The numbers used to calculate the Equity Value from Enterprise Value are the same as in the DCF and Trading Multiples Peers. The implied range of share values are illustrated in Figure 133. The implied share price was then calculated through the weighting of the multiples. In the realistic scenario (Median), the Valuation results in an implied share price of €5.84, which represents a premium of 66.52% (Figure 132). The pessimistic scenario (25th percentile) leads to an implied share price of €3.49 (Discount of -0.63%), and the optimistic scenario (75th percentile) leads to an implied share price of €7.89 (Premium of 124.77%). The valuation based on

Characteristics

- Transactions after 2020
- Acquisitions only and no mergers
- Positive EBITDA
- Stake acquired >25%
- Enterprise Value > 1bn
- Main Source of Revenue from Telecommunication Service
- Main Source of Revenue in Europe (UK included)

Figure 130: Characteristics Transaction Multiples

Source: Group Analysis

Announced Date	Target Company	Target Description	Target Country	Implied Equity Value (€T)	Bidder Company
11/09/2020	Altice Europe NV (50.66% Stake)	Multinational cable and telecommunications company.	France, Netherlands	7'563'983	Patrick Drahi (Private Individual)
12/08/2020	Sunrise Communications AG	Switzerland-based provider of mobile telephony, fixed network, and Internet services for households and business clients	Switzerland	5'460'440	Liberty Global Plc
01/06/2020	Masmovil Ibercom SA (90.8% Stake)	Provider of internet, telephony, broadband and dedicated servers services.	Spain	3'297'880	Lorca telecom BidCo
21/09/2020	PLAY Communications S.A.	Poland-based provider of wireless and telecom services	Poland	2'630'246	Iliad SA
29/03/2021	Euskaltel, S.A.	Spain-based operator of broadband telecommunications and provider of fixed and mobile telephone, internet and cable television services	Spain	2'311'851	Masmovil Ibercom SA
30/07/2021	Iliad SA (29.37% Stake)	France-based provider of fixed telephony services and an operator of alternative dial-up and broadband ISP services	France	12'886'990	Xavier Niel (Private Individual)
17/12/2020	TalkTalk Telecom Group Ltd (70.48% Stake)	Provider of landline, broadband, fibre, TV, and mobile telecommunication services.	United Kingdom	1'509'046	Toscafund Asset Management LLP
21/03/2023	Telenet Group Holding NV (38.92% Stake)	Belgium-based telecommunications operator	Belgium	2'567'897	Liberty Global Plc; Liberty Global Belgium Holding BV

Figure 131: Overview Past Transactions

Source: Group Analysis

Group Part

Multiple	Weights
EV/Revenue	5%
EV/EBITDA	35%
EV/EBIT	30%
P/E	30%

Scenario	realistic
Implied Share Price (€)	5.84
Current Share Price (€)	3.51
Premium / (Discount)	66.52%

Figure 132: Implied Share Price Transaction Multiples

Source: Group Analysis

transaction multiples adds value but must be considered with care, as in acquisitions usually a premium is paid for the target company, which leads to higher multiples.

NOS SGPS - Comparable Companies		NOS - Implied Range of Share Value				
Current Share Price (€)						
Valuation Date			pessimistic	realistic	optimistic	
Scenario	Multiple	Minimum	25th Perc.	Median	75th Perc.	Maximum
EV/Revenue		0.59	4.25	5.80	6.57	11.40
EV/EBITDA		3.00	4.93	7.27	9.35	12.66
EV/EBIT		0.98	2.20	3.19	6.32	22.71
P/E		0.67	2.97	6.84	7.97	26.57

Figure 133: Implied Range of Share Values Transaction Multiples

Source: Group Analysis

7.2 Risk

7.2.1 Company Specific Risk

In the context of company specific risks associated with NOS, there are several uncertainties that deserve attention. Firstly, the emergence of new competitors such as Digi in what appears to be an already saturated market raises questions about the potential impact on NOS's market position and profitability. The telco industry is highly competitive, and the entry of new players could lead to increased pricing pressures and a potential erosion of NOS's market share.

Additionally, another specific risk lies in the company's increased CapEx in recent years. While NOS is investing heavily in infrastructure and 5G technology enhancements, it remains to be seen whether these investments will translate into a significant gain in market share or increased revenue. The success of these CapEx initiatives will depend on various factors, including market dynamics, consumer demand, and the company's ability to effectively leverage its investments to stay competitive in the rapidly evolving telecommunications landscape.

7.2.2 Market Risk

Market risks affecting telco companies like NOS extend beyond their specific operations and encompass broader economic and industry-wide challenges. One significant concern is the potential difficulty in passing on increasing costs, driven by factors like inflation and energy prices, to customers through higher prices. Telco firms may face constraints in adjusting pricing strategies due to competitive pressures and customer sensitivity to rate hikes, which could impact on their profitability and financial stability.

Furthermore, the ever-growing importance of cybersecurity cannot be „CFA Research Challenge – NOS Equity Valuation – A 5G Era Perspective; Enhancing Equity Valuation through Monte Carlo Simulations” 46

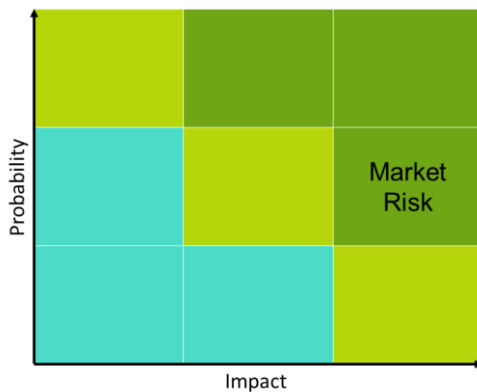


Figure 134: Risk Matrix - Market Risk

Source: Group Analysis

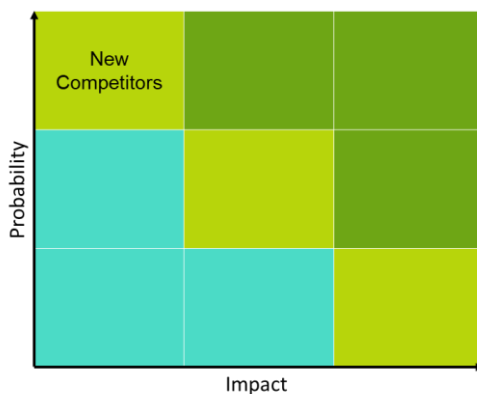


Figure 135: Risk Matrix - New Competitors

Source: Group Analysis

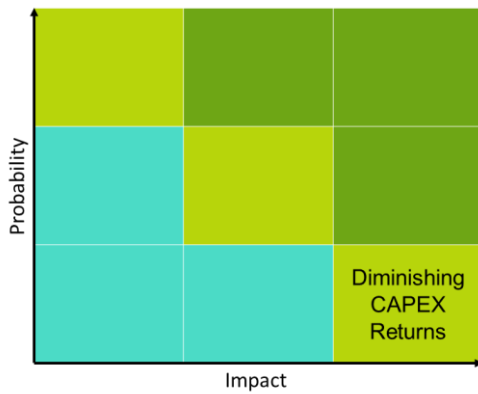


Figure 136: Risk Matrix - CAPEX

Source: Group Analysis

underestimated. Telcos handle vast amounts of sensitive data and are vulnerable to cyber threats that can not only disrupt their operations but also damage their reputation. Ensuring robust cybersecurity measures and safeguarding against potential breaches is paramount to mitigating this market risk.

Another dimension of market risk for NOS relates to the simultaneous increase in capital expenditures and the possibility of declining margins. As the company invests in infrastructure and technology upgrades to stay competitive and meet evolving customer demands, the pressure on margins may intensify. Striking a balance between necessary investments and maintaining profitability will be crucial in navigating this challenging landscape.

7.2.3 Regulatory Risk

Market risks, especially regulatory dynamics, hold substantial sway over companies like NOS in the telecommunications sector. Telecommunications operations are heavily regulated, with governments overseeing various aspects, including pricing controls, spectrum allocation, and adherence to principles like net neutrality.

Any changes in these regulations can have significant consequences for NOS. For instance, alterations in pricing controls or spectrum allocation can directly impact NOS's pricing strategies and profitability. Staying informed about regulatory changes is crucial because they can bring both opportunities and challenges. Effectively navigating this regulatory landscape requires not only compliance but also proactive engagement with policymakers to advocate for industry interests. Regulatory risk, therefore, is a critical factor influencing NOS's competitiveness and financial stability.

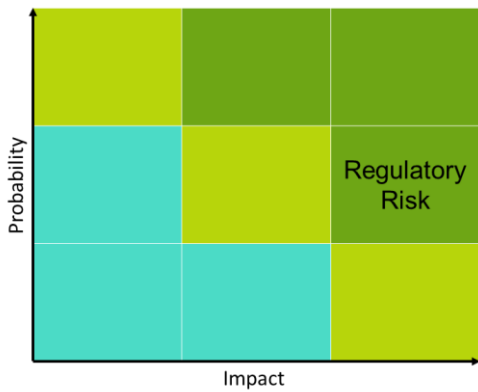


Figure 137: Risk Matrix - Regulatory Risk

Source: Group Analysis

7.2.4 Technological Risk

In the fast-evolving world of telecommunications, technology is a double-edged sword. While it offers opportunities for growth and innovation, it also presents risks. Telecommunications companies like NOS must constantly adapt and invest in new technologies to stay competitive and meet customer demands. However, this pursuit of innovation is not without challenges.

The rapid pace of technological advancement can make existing infrastructure and services outdated. NOS, like other telecom firms, faces the challenge of balancing the maintenance of older systems with the integration of new technologies. The financial burden of these upgrades can impact the company's costs and profits.

Moreover, emerging technologies like 5G and the Internet of Things (IoT) bring

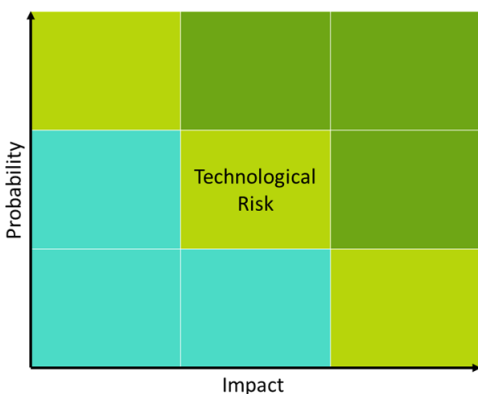


Figure 138: Risk Matrix - Technological Risk

Source: Group Analysis

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both promise and uncertainty. While they offer new revenue streams, they require significant investments and may not guarantee immediate widespread adoption.

7.2.5 Monte Carlo Simulation

To address potential risks and uncertainties, a Monte Carlo simulation was conducted on various variables. The variables considered most uncertain include the WACC, the terminal growth rate of the telecommunication segment, NOS market share in ten years, and efficiency gains.

The WACC, being a dynamic variable influenced by market dynamics like interest rates and equity premium, was modeled using a gamma distribution. This distribution exhibits a fat tail towards the right side, with a lower bound set at 5%, a mean of 5.5%, and an upper bound of 8%, reflecting historical and current WACC trends for NOS.

The perpetual growth rate in the telecommunications sector is a critical variable that significantly influences overall pricing, yet it poses a considerable level of uncertainty. Despite NOS providing guidance indicating a perpetual growth rate of 2%, this may be overly optimistic given factors such as declining demographics and a highly saturated and competitive market. To account for these uncertainties, a normal distribution was employed with a mean of 1% and an upper bound of 2%. This choice aims to avoid assuming a growth rate higher than the overall growth of the Portuguese GDP.

The company expressed in their last presentation the will to increase efficiency gains on specific items of their operational costs. Support services as well as Supplies and external services have been designated by the firm as would be impacted by digitalization efforts in the future in the next couple of years. To set the lower and upper bounds of those efficiency gains we observed former decrease of those items relatively to revenues. The upper bounds have been determined as the previously realized gains in productivity which were already of 1.45% per year for support services and 0.61% supplies and external services. The lower bound in that case will be set at zero since we have to keep the possibility that those projects don't pay out.

NOS presently holds a market share of approximately 31% in Portugal. However, this is anticipated to change with the entry of new competitors into the Portuguese market. The extent of this impact is inherently uncertain and contingent on various factors. To address this uncertainty, a simulation for the market share in ten years has been conducted. The simulation is based on the current market share, with an upper bound of 40% and a lower bound of 20%. This range reflects the expectation that new competitors will inevitably

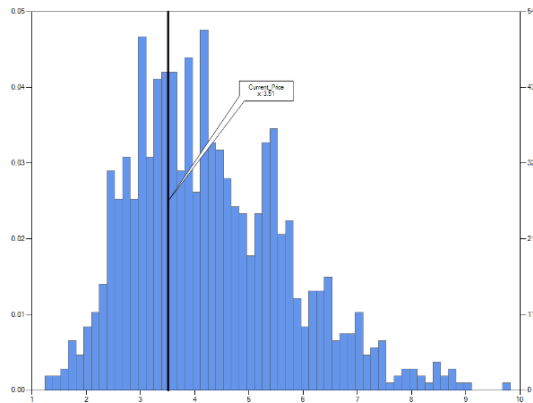


Figure 139: Monte Carlo - Value per Share Distribution

Source: Group Analysis

Mean	30th Percentile	70th Percentile
4.31	3.45	4.89

Figure 140: Monte Carlo - Recommendation Range

Source: Group Analysis

erode NOS's market share, although the extent of this erosion may vary, with potential challenges for competitors to gain a foothold.

Based on this Monte Carlo model, a mean price per share of €4.31 was obtained. Based on Current price of €3.51 and percentiles of the final distributions, there is 66% probability that the intrinsic value of NOS is higher than the current price. Utilizing a margin of safety of +-20 percentile to establish a fair value range, the Monte Carlo simulation indicates a range between €3.45 and €4.89 per share. This suggests that, while the current stock price falls within this range, it resides on the lower end. This positioning implies that there is a higher likelihood of upside potential for the stock compared to the downside. In other words, the stock's potential for an upward movement is more probable than a downward one within the context of the calculated fair value range.

8 Conclusion

Recommendation

BUY

Date	06.11.2023
Current Price	€ 3.51
Target Price	€ 4.18
Upside	19.07%

In conclusion, NOS faces a dual challenge marked by lower liquidity and heightened competition from both established players and new entrants in the telecommunications market. Despite these concerns, the company is strategically positioned to harness opportunities arising from its leadership in Portugal's growing 5G sector. NOS's proactive approach to technological innovation and infrastructure development underscores its commitment to maintaining a competitive edge.

While the threat of new entrants and high competition poses challenges, NOS's resilience in the face of market dynamics is evident. The company's strategic initiatives, coupled with a focus on improving operational efficiency, position it favorably to navigate the evolving landscape. The entry of new players may intensify competition, but NOS's established market presence and technological prowess are valuable assets.

In acknowledging the maturity of the telecommunications market, NOS is wisely shifting its focus towards margin improvement. This strategic move demonstrates the company's adaptability and proactive measures to enhance profitability in a competitive environment. NOS's commitment to sustainable growth aligns with the broader industry trends and positions it as a formidable player in the telecommunications sector. These improvements will prove crucial as the company embarks on its next investment cycle in 6G technology in around ten years' time. The macroeconomic context which forecast multiple interest cuts for 2024 will allow as well stronger margins and opportunities for the firm to maintain an appealing risk degree into their capital structure.

Given the complexity of the market, it is essential to assess both risks and opportunities. Despite the challenges, NOS shows robust fundamentals and smart strategic initiatives. The company's leading role in 5G technology combined with its ability to overcome market challenges make NOS an attractive investment opportunity. This is confirmed by the various valuation methods conducted, which show that NOS appears to be significantly undervalued. We therefore issue a Buy recommendation for NOS's stock with a target price of €4.18, which represents an upside of 19.07% to the closing price on 06/11/2023. As NOS continues to evolve within the telecommunications industry, its forward-thinking strategies and technological leadership present a promising outlook for sustained growth and profitability.

„Enhancing Equity Valuation through Monte Carlo Simulations“

9 Individual Part: Jakub Zogata

Enhancing Equity Valuation through Monte Carlo Simulations

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Abstract:

This thesis explores the enhancement of equity valuation through Monte Carlo simulation, emphasizing the critical aspects of selecting appropriate inputs, distributions, and correlations. The study delves into the application of Monte Carlo models in equity valuation, focusing on the specific case of NOS. A meticulous examination is conducted, comparing the outcomes of the Monte Carlo model with the assessments provided by analysts covering NOS. Through this analysis, the research seeks to provide valuable insights into the efficacy and reliability of Monte Carlo simulation in refining equity valuation practices, with a practical application to the assessment of NOS's financial performance

Key Words:

Monte Carlo Simulation, Equity Valuation, DCF, Non-Normal Distribution, Correlation, Quasi-Random, Financial Modeling, Risk analysis, Probability Density Function

Introduction

Equity valuation involves a significant level of uncertainty, especially when forecasting future trends. Analysts frequently provide precise stock price predictions down to two decimal places, despite the inherent uncertainty stemming from factors such as future growth, market share, and fluctuating discount rates. This precision may create a misleading sense of accuracy, as these forecasts primarily rely on probabilistic estimates for individual inputs. This study aims to highlight that not only are the numbers beyond the decimal point often arbitrary, but even the exact target share prices rounded to the nearest dollar can be arbitrary as well. While methods such as scenario and sensitivity analysis made this process more flexible, Monte Carlo allows analysts to truly incorporate uncertainty into their models. However, it's important to note that the misuse of Monte Carlo analysis can result in numerous pitfalls.

This thesis aims to break down the basics of Monte Carlo analysis in valuation, examine common pitfalls, and compare this technique with insights from industry experts as reflected in analysts' consensus.

Basics of Monte Carlo Simulation

Monte Carlo (MC) simulation (Ulam 1949) is a statistical method used to model probabilities influenced by uncertain variables. MC has various uses across multitude of industries and fields of study. In finance it is commonly used for option pricing, risk management, portfolio optimization, et cetera. Monte Carlo simulation employs the Girsanov theorem, specifically changes of measure, to adjust probability distributions, by transitioning from real-world probabilities to a risk-neutral measure to model different scenarios (Girsanov 1960). Simultaneously, the accuracy of Monte Carlo results is further enhanced by leveraging the law of large numbers. This statistical principle ensures that as the number of iterations increases, the simulated outcomes converge towards the expected values, contributing to a more precise representation of the underlying probability distributions. Monte Carlo has established a strong presence in valuation, given its versatility in handling multifactor models and „CFA Research Challenge – NOS Equity Valuation – A 5G Era Perspective; Enhancing Equity Valuation through Monte Carlo Simulations”

forecasting numerous uncertain variables. It utilizes random sampling with a predetermined number of iterations and the probability distribution shape.

Quasi-random sampling methods, exemplified by Latin hypercube sampling, exhibit a propensity to evenly distribute samples throughout intervals of the probability distribution (Kucherenko 2016). This characteristic guarantees a faithful representation of the parameter space even with a reduced number of iterations. The use of quasi-random sampling enhances efficiency in exploring the parameter space, irrespective of the probability distribution's shape (Exhibit 2, *Appendix A*).

This method accelerates the convergence of the estimated mean to the actual value, particularly beneficial in scenarios where a limited number of iterations is a constraint. For these reasons, Latin hypercube sampling is a favored method in MC simulators.

Increasing the number of iterations theoretically enhances model accuracy, following the law of large numbers (Bernoulli 1713). However, there are diminishing returns, and doubling the iterations may not halve the error. Analysts must strike a balance between accuracy, denoted by variance per replication in the following formula, and managing costs associated with heightened computational power demands, represented by the expected computing time per replication. One way of approaching this problem, proposed by Glasserman (2003), is by minimizing the following formula:

$$(\text{variance per replication}) \times (\text{expected computing time per replication})$$

While lower error suggests precision, it doesn't guarantee accuracy if the model relies on flawed data, assumptions, or probability distributions. The 'garbage in, garbage out' principle remains paramount.

Non-Normal Distributions

Real-life probability distributions of financial variables often deviate substantially from the commonly employed Gaussian (normal) distribution. Instead, they frequently exhibit characteristics such as fat tails, skewness, lognormality, or uniformity. Surprisingly, despite this mismatch between reality and theory, a substantial number of financial analysts persist in relying exclusively on normal distributions for modeling all variables within their Monte Carlo models. Using normal distributions for risk assessment in valuation can lead to significant issues, as it often ignores the existence of tail risks and may underestimate the actual level of risk associated with the asset or financial instrument being evaluated. Proper usage of non-normal distributions, as shown in Exhibit 1 (*Appendix A*), is crucial in correctly setting up Monte Carlo simulation (Hogan 2015).

Black Swans, as per Taleb's definition, are impactful events that are impossible to predict. These events are typically unprecedented for the company being evaluated, such as COVID-19, thus their impact is uncertain and cannot be precisely determined. Although fat-tailed distributions may not predict Black Swans or their specific effects, they are more adept at representing the risk associated with these unpredictable events than a normal distribution.

While Monte Carlo simulations can offer a sense of analytical security, relying on incorrect inputs and assumptions, coupled with a false sense of certainty, can lead to disastrous outcomes. As an illustrative case, Long-Term Capital Management L.P. (LTCM), a hedge fund managed by Nobel Prize-winning economists, misjudged risk due to overreliance on their financial models, particularly correlation estimations, and excessively leveraged their assets. This miscalculation led to the fund's collapse and subsequent bailout (Lowenstein 2000).

To choose a fitting distribution, analysts must employ a combination of statistical analysis, financial theory, and logical reasoning. Computing essential statistical metrics, including the mean, skewness, standard deviation, and kurtosis, can offer a preliminary insight into the

historical distribution shape of each variable. Analysts can combine these statistical insights with their research into a company and its industry to predict future trends. Nevertheless, it is crucial to bear in mind that historical data may at times be limited, incomplete, or not entirely indicative of forthcoming trends. It's crucial to apply critical thinking when modeling individual variables. For instance, the revenue growth rate of NOS audiovisuals, which has a standard deviation around 30% in the past 4 years, whereas earlier data might be misleading due to accounting changes at NOS. The limited data history, amplified by the significant impact of COVID-19, has caused notable revenue fluctuations within the observed sample. In such cases, analysts might look for additional sources to estimate the growth rate and its variability more accurately, sources such as industry growth forecasts or company guidance.

When choosing a distribution for a variable, the first consideration is whether the outcomes are discrete or continuous. Variables such as dividend payments, credit rating downgrades, or changes in tax rates have discrete distributions, being countable and distinct. Conversely, growth rates or profit margins are continuous, allowing for any value within a given range without restriction to discrete quantities or intervals. Furthermore, assessing the likelihood of outliers and their likely skewness is crucial. Such an analysis offers insight into the distribution's symmetry. This consideration is also vital for capturing the nature of the tails, which reflects the extremity of potential outcomes and the risk of rare, significant deviations from the mean.

Inadequate Model Inputs and Assumptions

Monte Carlo analysis requires additional assumptions beyond distribution, including mean, standard deviation, and correlation. Incorporating sanity checks and constraints is crucial. For instance, the terminal growth rate should not surpass the economy it operates in, avoiding a scenario where the company exceeds the country's economy. Similarly, assuming a negative growth rate implies the company will cease to exist, requiring careful consideration.

Correlation plays an important role in the integrity and accuracy of financial models, yet its

significance is often overlooked (Wall 1997). In the realm of finance, though there exist some independent variables, a large number are interrelated. For instance, consider the costs associated with products sold — these costs align directly with the quantity of units sold and, consequently, with the generated revenue. Any comprehensive valuation model must reflect such relationships to ensure the accuracy and relevance of its predictions. However, when confronted with a limited statistical sample, it is crucial to complement statistical analysis with logical reasoning and financial insight. This approach helps discern whether the observed correlation is plausible or merely a result of sporadic occurrences.

While various variables inherently introduce uncertainty, employing Monte Carlo simulations for each one is not advisable. Indiscriminate application may result in an excessively broad range of outcomes for metrics such as Enterprise Value or value per share, potentially lacking meaningful insights. To mitigate this, it's more prudent to selectively simulate key variables that hold both significance and high uncertainty. Performing a sensitivity analysis is recommended to identify influential variables. By systematically varying each variable and observing its impact on the outcome, analysts can assess the relative effects of changes in each variable.

Black Box Model

Monte Carlo-powered valuation models risk becoming black box models without proper precautions. A key concern is the lack of documentation for assumptions, logic, or methodology, leaving users uninformed about the model's inner workings.

While Excel-based Monte Carlo models can be audited, proprietary software and code complicate this process. Moreover, an overly complex model structure and reliance on default settings worsen the black box problem. Nested calculations and dynamic relationships make it hard for users to grasp the model's mechanics, while default settings can obscure important setup decisions. To tackle these issues, providing users with a step-by-step setup guide, explicit

details about distributions, and the rationale behind choices is crucial. For models beyond Excel, sharing information on software acquisition and operation is essential. This transparency not only improves model auditability but also empowers users to comprehend and trust results, instilling confidence in the valuation process.

Monte Carlo Model

To illustrate the systematic process of developing a Monte Carlo-enhanced Discounted Cash Flow (DCF) model and underscore its additional insights, a valuation model was created from an analyst's perspective as of March 14th, 2023. This specific date was chosen as it aligned with the publication of Q4 results for the year 2022. At that time, NOS stock was trading at €4.2, and analysts' consensus target price was €4.08, indicating a perceived fair valuation of the stock (FactSet Research Systems Inc. 2023).

Given the focus on Monte Carlo in this valuation, the model was deliberately simplified. Key variables were sourced from NOS quarterly and annual financial statements and their forecast guidance (NOS 2023). NOS's comprehensive analysis provided insights into growth rates, along with directional guidance on margin growth and reinvestments.

The effective tax rate was computed by relying on historical tax data due to a lack of specific details pertaining to Research and Development (R&D) or other factors that could potentially lower taxes.

The Monte Carlo simulation relied on the open-source Excel add-in *Argo* (*Appendix B*). Conducting the same simulation is equally feasible using basic Excel functions or Python, the latter providing enhanced computational power. Excel, though not adept at handling large iterations efficiently, offers a user-friendly platform for auditing due to its simplicity.

Base Case

To enhance the practicality and minimize the impact of hindsight bias, the base scenario relies on the guidance provided by the company when accessible, as of 14th of March 2023. This approach ensures a pragmatic orientation in the paper's analysis. For instance, NOS provides a forecasted growth rate of 3% annually in the telecommunications sector, followed by a subsequent decrease to 2% in 2028. Additionally, NOS anticipates a long-term growth rate of 2% for the audiovisuals sector, although the guidance before 2026 is less definitive. In this scenario, it is assumed that the audiovisuals sector will revert to its pre-pandemic figures in the subsequent two years and grow at 2% thereafter, based on NOS's guidance.

The forecast for the reinvestment rate presented challenges, necessitating the use of Aswath Damodaran's database (Damodaran 2023). The database provided the average reinvestment rate for the telecommunications sector of 36.16% and the Audiovisuals sector based on an advertisement reinvestment rate of 55.56%, along with margin estimates for individual industries. To account for the anticipated advent of 6G technology, a higher reinvestment rate is assumed for the telecommunications sector, specifically during those years, equivalent to the reinvestment in the telecommunications equipment sector of 49.98% (Damodaran 2023).

Effective tax rates were forecasted based on past trends where they are separated into years of increased CAPEX and 'Normal' years due to the relationship between increased Research and Development part of CAPEX and tax deductions. Research into the Portuguese telecommunications market indicates limited growth potential in terms of subscribers, consistent with the company's conservative revenue growth forecast. Consequently, NOS is expected to seek opportunities beyond subscriber expansion, focusing on strategies such as cost reduction and efficiency enhancement to boost margins. This trend was evident in the 2022 fiscal year, where margins surpassed 17%, showcasing the company's proactive approach to improving efficiency and financial performance. The forecast therefore anticipates sustained

higher margins alongside a more gradual revenue growth to align with the maturity of the Portuguese telecommunications market. Specifically, it assumes a margin of 18% which is slightly higher than margin in previous year and slightly lower than industry average of 19.98% for telecommunications services industry and 18.34% for Telecommunications equipment industry (Damodaran 2023).

Forecasting the financial performance of the audiovisuals segment has proven more intricate than that of the telecommunications sector due to its multiple revenue streams and the pronounced impact of COVID-19 in recent times. This has led to substantial fluctuations in revenue growth, with a standard deviation of approximately 30%. In the base case scenario, the assumption is made that revenues will return to pre-pandemic levels by 2024. Additionally, it is projected that operating margins will stabilize and remain in line with the levels observed before the onset of the COVID-19 pandemic. Finally, based on average Bloomberg WACC estimate for each quarter of 2022, discount rate of 6.55% was assumed (Exhibit 5, *Appendix A*). Building a valuation model with the provided assumptions yields a per-share estimate of €3.71, as depicted in Exhibit 8 (*Appendix A*), positioning it slightly below the current stock price and the street consensus. However, it is crucial to recognize that, despite the model's reliance on guidance, some variables based on averages or assumptions may experience fluctuations over time instead of remaining stable. Assuming stability in these variables overlooks the inherent uncertainties and dynamic changes in the market.

Distributions and Correlations

Monte Carlo simulation proved invaluable in addressing the uncertainty and fluctuations embedded within the model. It allows to move beyond inputting a singular value and, instead, incorporate a range, offering a more realistic representation of potential outcomes. Additionally, Monte Carlo enables to define the shape of the distribution within this range. In light of evident trends indicating rising margins, pinpointing precise operating margins for each year from the

present to the terminal year poses a challenge. To address this uncertainty, a Beta distribution with a pronounced fat tail towards the right side and the following probability density function was adopted: Additionally, the beta distribution has a lower bound of 13% and upper bound of 23%.

$$f(x; 3,5) = \frac{x^3 \times (1 - x)^1}{B(3,5)}$$

This choice reflects a higher likelihood of experiencing increased margins, capturing the dynamic and evolving nature of the business landscape. Conversely, considering the mature state of the Portuguese telecommunications industry, the prospect of substantial revenue growth is deemed unlikely. However, the sector's maturity also implies vulnerability to reputational risks and unforeseen black swan events, which could result in significant downturns. Consequently, similarly to the approach taken for operating margins, a Beta distribution was employed to model the probability of revenue growth. In this case, the distribution exhibits a fat tail on the left side, indicating the potential for significant declines due to unexpected events and limited growth prospects. The probability density function has alpha equal to 4 and beta equal to 2, as illustrated in Exhibit 3 (*Appendix A*), with an upper bound at 8% and a lower bound at -4%.

To account for the inherent uncertainty in the audiovisuals segment, the operating margin has been modeled utilizing a Cauchy distribution with a mean based on margins in non-COVID-19 years. This distribution is characterized by a lower bound of 5% and an upper bound of 30%, reflecting the increased likelihood of extreme values occurring on both ends of the distribution, albeit with a greater emphasis on the left side.

Exhibit 4: Simulated Variables

Variable	Mean	Upper bound	Lower bound	Standard Deviation	Distribution	Shape
Telco						
Revenue Growth	2.10%	8%	-4%	x	Beta	
EBIT Margin	16.75%	23%	13%	x	Beta	
Effective Tax Rate	12.00%	15%	9%	x	Uniform	
Reinvestment Rate	40.50%	36%	45%	x	Uniform	
Audiovisuals						
EBIT Margin	23.12%	30%	5%	4.30%	Cauchy	

Source: Own Analysis

This approach acknowledges the potential for significant deviations in the operating margin, particularly in the lower range, contributing to a more robust representation of the segment's financial variability.

No significant correlation was discovered between revenue and EBIT in the telecommunications segment.

Exhibit 7: EBIT revenue correlation

Correlation	Revenue	EBIT
EBIT	0.129685041	1
Revenue	1	0.129685041

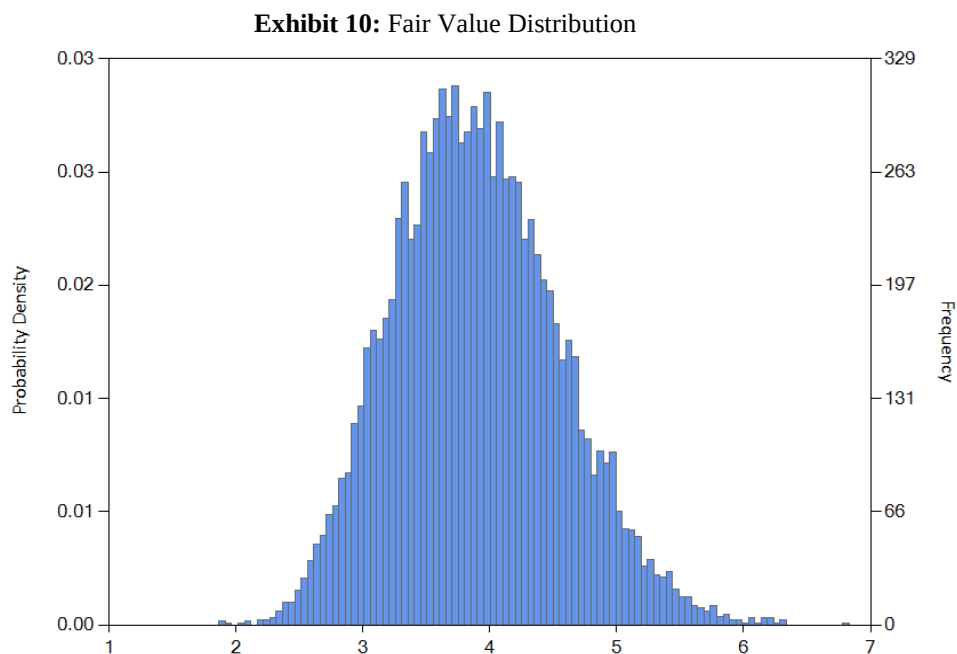
Source: Own Analysis

Consequently, this correlation was omitted from the analysis. However, a significant negative correlation was identified between the reinvestment rate and paid taxes, and this correlation is attributed to the tax laws in Portugal. Portuguese legislation specifically incentivizes research and development investments as a means to stimulate technological progress and innovation. Given the observed negative correlation between the reinvestment rate and paid taxes, it has been assumed that both the reinvestment rate and effective tax rate follow uniform distributions. Furthermore, a robust inverse correlation has been incorporated into the modeling, reflecting the strong relationship between these two variables (see Exhibit 6, *Appendix A*).

Monte Carlo Simulation and Results

As mentioned earlier, a freely available open-source Excel add-in was employed for the simulation process. Given the limitations in computational resources, the simulation comprised 10,000 iterations and utilized Latin hypercube sampling to enhance convergence.

While the base case valuation yields a value per share of 3.71 €, the Monte Carlo simulation yields mean of 3.90 € per share and enables us to frame this value within a range between 3.53 € and 4.22 €, which can be found in Exhibit 11 (*Appendix A*), considering the ± 20 th percentile from the mean as a margin of safety (Graham and Dodd 1934).



Source: Own Analysis

Specifically, the simulation clarifies that although the mean value aligns relatively close with street consensus and the current stock value—possibly influenced by the broader upswing in the Portuguese equity market at the time—this value sits at the upper end of the range determined by uncertainty. Consequently, even though the shares appear to be reasonably priced *ceteris paribus*, there is a heightened risk of downside potential compared to upside potential in this investment.

Comparison with Consensus

The Monte Carlo simulation initiated on March 14, 2023, aimed not only to compare against prevailing street consensus and current pricing but also to assess its alignment with consensus in the subsequent months. Despite some assumptions relying on historical averages and quantitative methodologies, this intentional selection sought to reduce hindsight bias by minimizing the author's knowledge influence on future events. Following the earnings release, NOS witnessed a surge to 4.44 € per share in April, subsequently declining to 3.26 €. Comparing the street consensus to the price as of March 14th 2023, suggests analysts perceived the stock as fairly valued or possibly slightly overvalued. The proximity raises concerns about anchoring bias, where analysts' forecasts might be unconsciously swayed by the current market price. Anchoring bias ties predictions too closely to existing conditions. Despite biases, Monte Carlo simulations play a pivotal role in mitigating their impact on forecasting and recommendations by offering flexibility in addressing uncertainty and providing a fair value range.

Conclusion

While the Monte Carlo simulation is a valuable addition to a valuation model, it cannot and should not replace a comprehensive valuation and thorough research. When used appropriately, the Monte Carlo simulation provides insights into the impact of uncertain variables, eliminating the need for arbitrary assumptions. It allows for more flexibility in equity valuation and, importantly, enhances the ability to output a range of possible outcomes instead of a single deterministic number. This is supported by probabilistic percentiles and margins of safety, providing analysts with a more nuanced understanding of the potential risks and rewards associated with the valuation. Analysts need a good understanding of statistical methods, various distributions, and financial logic to effectively implement and interpret the results of the simulation. Although a potent tool, its effectiveness depends on the skills and knowledge of

analysts within the broader context of financial analysis and valuation. The Monte Carlo simulation's capability to generate a range of outcomes fosters a more realistic and comprehensive perspective, enabling analysts to consider a spectrum of possibilities and make more informed decisions in the face of uncertainty.

10 Appendix:

10.1 Appendix: Group

1. Appendix: OpenSignal Mobile Experience Awards July 2023



Source: (NOS SGPS, SA 2023)

2. Trends in telecommunications prices September 2022

Categories September 2022	MEO	NOS	NOWO	Vodafone
TV	18,98	30,99	23,96	30,90
Broadband	24,99	24,99	19,17	25,90
FV	14,99	12,58	21,56	0,29
Mobile	0,36	1,11	7,19	1,11
Mobile with Internet	7,19	7,50	7,19	12,5
Mobile BB PC tablet/pen/router	13,99	15		15
BB+TV	30,99	30,99	23,96	30,90
BB+FV	27,99	30,99	21,56	25,90
TV+FV	30,99	30,99	24,06	30,90
BB+TV+FV	30,99	30,99	24,06	30,90
BB+TV+FV+Mobile	51,74	51,99	31,56	51,90
BB+TV+FV +Mobile+ Mobile with internet	51,74	51,99	31,56	51,90
BB+TV+FV +Mobile+Mobile with internet+ Mobile BB PC/tablet/pen/router	59,74	56,99		56,90

Source: ANACOM Trends in telecommunications prices September 2022

3. Trends in telecommunications prices September 2023

Categories September 2023	MEO	NOS	NOWO	Vodafone
TV	18,98	32,99	23,75	32,9
Broadband	24,99	24,99	19,17	24,9
FV	14,99	9,99	21,56	0,31
Mobile	0,36	1,4	7,5	1,19
Mobile with Internet	7,5	7,5	7,5	16,25
Mobile BB PC tablet/pen/router	13,99	16		15,9
BB+TV	32,99	32,99	23,75	32,9
BB+FV	31,99	32,99	21,56	24,9
TV+FV	31,62	32,99	23,75	32,9
BB+TV+FV	32,99	32,99	23,75	32,9
BB+TV+FV+Mobile	57,99	57,99	31,25	58,9
BB+TV+FV +Mobile+ Mobile with internet	57,99	57,99	31,25	58,9
BB+TV+FV +Mobile+Mobile with internet+ Mobile BB PC/tablet/pen/router	65,99	63,99		63,9

Source: [ANACOM Trends in telecommunications prices September 2023](#)

4. Balance Sheet Annualized incl. Forecast

Annually									
(Amounts stated in thousands of euros)		2018	2019	2020	2021	2022	2023e	2024e	2025e
Group Total									
Core									
Total current assets		529 978	542 847	463 662	497 508	524 517	558 932	566 428	573 315
YoY Growth%			2.43%	-14.59%	7.30%	5.43%	6.56%	1.34%	1.22%
% of total assets		17.33%	17.64%	15.35%	15.31%	15.20%	16.09%	16.16%	16.22%
Total current liabilities		557 893	599 231	561 460	588 882	597 003	646 160	666 448	674 620
YoY Growth%			7.41%	-6.30%	4.88%	1.38%	8.23%	3.14%	1.23%
% of total assets		18.24%	19.47%	18.58%	18.12%	17.30%	18.60%	19.02%	19.09%
Working Capital: Group Total		- 27 915	- 56 384	- 97 798	- 91 374	- 72 486	- 87 228	- 100 020	- 101 305
YoY Growth%			101.99%	73.45%	-6.57%	-20.67%	20.34%	14.66%	1.29%
% of total assets		-0.91%	-1.83%	-3.24%	-2.81%	-2.10%	-2.51%	-2.85%	-2.87%
Non-current assets									
Tangible assets		1 026 355	1 034 813	991 613	1 041 100	1 107 052	1 100 428	1 116 966	1 133 771
YoY Growth%			0.82%	-4.17%	4.99%	6.33%	-0.60%	1.50%	1.50%
% of total assets		33.56%	33.63%	32.82%	32.03%	32.09%	31.67%	31.87%	32.08%
Intangible assets		1 019 256	1 014 066	1 041 087	1 205 031	1 209 558	1 207 167	1 204 633	1 202 823
YoY Growth%			-0.51%	2.66%	15.75%	0.38%	-0.20%	-0.21%	-0.15%
% of total assets		33.32%	32.95%	34.46%	37.07%	35.06%	34.74%	34.37%	34.04%
Contract costs		162 948	163 101	162 123	162 118	160 594	158 907	158 507	158 199
YoY Growth%			0.09%	-0.60%	0.00%	-0.94%	-1.05%	-0.25%	-0.19%
% of total assets		5.33%	5.30%	5.37%	4.99%	4.65%	4.57%	4.52%	4.48%
Rights of use		200 483	218 383	260 097	236 063	297 723	311 079	318 701	325 497
YoY Growth%			8.93%	19.10%	-9.24%	26.12%	4.49%	2.45%	2.13%
% of total assets		6.55%	7.10%	8.61%	7.26%	8.63%	8.95%	9.09%	9.21%
Investments in jointly controlled companies and associated companies		19 585	18 244	10 897	18 091	38 961	35 182	35 318	35 318
YoY Growth%			-6.85%	-40.27%	66.02%	115.36%	-9.70%	0.39%	0.00%
% of total assets		0.64%	0.59%	0.36%	0.56%	1.13%	1.01%	1.01%	1.00%
Accounts receivable - other		4 529	4 064	7 504	5 914	4 758	6 120	6 208	6 291
YoY Growth%			-10.27%	84.65%	-21.19%	-19.55%	28.63%	1.44%	1.33%
% of total assets		0.15%	0.13%	0.25%	0.18%	0.14%	0.18%	0.18%	0.18%
Deferred income tax assets		94 404	80 428	82 782	81 390	89 554	90 710	91 756	92 896
YoY Growth%			-14.80%	2.93%	-1.68%	10.03%	1.29%	1.15%	1.24%
% of total assets		3.09%	2.61%	2.74%	2.50%	2.60%	2.61%	2.62%	2.63%
Other non-current assets		1 124	1 241	1 365	3 205	17 380	5 915	5 915	5 915
YoY Growth%			10.41%	9.99%	134.80%	442.28%	-65.97%	0.00%	0.00%
% of total assets		0.04%	0.04%	0.05%	0.10%	0.50%	0.17%	0.17%	0.17%
Total non-current assets		2 528 684	2 534 340	2 557 468	2 752 912	2 925 580	2 915 507	2 938 004	2 960 709
YoY Growth%			0.22%	0.91%	7.64%	6.27%	-0.34%	0.77%	0.77%
% of total assets		82.67%	82.36%	84.65%	84.69%	84.80%	83.91%	83.84%	83.78%
Total non-current liabilities		149 870	116 495	124 309	130 904	176 344	182 201	183 155	184 403
YoY Growth%			-22.27%	6.71%	5.31%	34.71%	3.32%	0.52%	0.68%
% of total assets		4.90%	3.79%	4.11%	4.03%	5.11%	5.24%	5.23%	5.22%
Invested Capital: Group Total		2 350 899	2 361 461	2 335 361	2 530 634	2 676 750	2 646 078	2 654 830	2 675 000
YoY Growth%			0.45%	-1.11%	8.36%	5.77%	-1.15%	0.33%	0.76%
% of total assets		76.86%	76.74%	77.30%	77.86%	77.58%	76.16%	75.76%	75.69%
Financing									
Current Financing									
Borrowings		283 061	143 281	167 126	301 068	427 453	300 780	298 512	293 905
YoY Growth%			-49.38%	16.64%	80.14%	41.98%	-29.63%	-0.75%	-1.54%
% of total assets		9.25%	4.66%	5.53%	9.26%	12.39%	8.66%	8.52%	8.32%
Excess cash		138	10 987	151 513	8 975	13 227	49 216	49 216	49 216
YoY Growth%			7884.21%	1279.02%	-94.08%	47.38%	272.07%	0.00%	0.00%
% of total assets		0.00%	0.36%	5.02%	0.28%	0.38%	1.42%	1.40%	1.39%
Non-current Financing									
Borrowings		1 014 364	1 216 847	1 363 514	1 275 541	1 210 181	1 425 631	1 415 421	1 394 380
YoY Growth%			19.96%	12.05%	-6.45%	-5.12%	17.80%	-0.72%	-1.49%
% of total assets		33.16%	39.54%	45.13%	39.24%	35.08%	41.03%	40.39%	39.46%
Total Financing		1 297 287	1 349 141	1 379 127	1 567 634	1 624 407	1 677 195	1 664 717	1 639 070
YoY Growth%			4.00%	2.22%	13.67%	3.62%	3.25%	-0.74%	-1.54%
% of total assets		42.41%	43.84%	45.65%	48.23%	47.08%	48.27%	47.50%	46.38%
Equity									
Total Equity		1 053 611	1 012 323	956 234	963 000	1 052 343	968 884	990 113	1 035 931
YoY Growth%			-3.92%	-5.54%	0.71%	9.28%	-7.93%	2.19%	4.63%
% of total assets		34.45%	32.90%	31.65%	29.63%	30.50%	27.89%	28.25%	29.31%

Source: Group Analysis

Annually									
(Amounts stated in thousands of euros)		2026e	2027e	2028e	2029e	2030e	2031e	2032e	2033e
Group Total									
Core									
Total current assets		580 642	588 370	595 744	603 830	611 089	617 823	623 446	629 532
	YoY Growth%	1.28%	1.33%	1.25%	1.36%	1.20%	1.10%	0.98%	
	% of total assets	16.29%	16.35%	16.41%	16.48%	16.30%	15.37%	15.17%	14.96%
Total current liabilities		683 863	693 312	702 742	712 971	722 380	731 100	738 466	746 352
	YoY Growth%	1.37%	1.38%	1.36%	1.46%	1.32%	1.21%	1.01%	1.07%
	% of total assets	19.18%	19.27%	19.36%	19.46%	19.27%	18.19%	17.96%	17.74%
Working Capital: Group Total		- 103 222 -	104 941 -	106 997 -	109 141 -	111 291 -	113 278 -	115 020 -	116 820
	YoY Growth%	1.89%	1.67%	1.96%	2.00%	1.97%	1.79%	1.54%	1.56%
	% of total assets	-2.90%	-2.92%	-2.95%	-2.98%	-2.97%	-2.82%	-2.80%	-2.78%
Non-current assets									
Tangible assets		1 150 847	1 168 198	1 185 828	1 203 741	1 273 290	1 346 916	1 424 855	1 507 358
	YoY Growth%	1.51%	1.51%	1.51%	1.51%	5.78%	5.78%	5.79%	5.79%
	% of total assets	32.28%	32.47%	32.67%	32.86%	33.97%	33.50%	34.66%	35.83%
Intangible assets		1 201 418	1 199 559	1 197 629	1 195 830	1 194 109	1 376 433	1 374 237	1 372 078
	YoY Growth%	-0.12%	-0.15%	-0.16%	-0.15%	-0.14%	15.27%	-0.16%	-0.16%
	% of total assets	33.70%	33.34%	32.99%	32.64%	31.86%	34.24%	33.43%	32.61%
Contract costs		157 565	157 150	156 712	156 258	155 772	155 324	154 871	154 415
	YoY Growth%	-0.40%	-0.26%	-0.28%	-0.29%	-0.31%	-0.29%	-0.29%	-0.29%
	% of total assets	4.42%	4.37%	4.32%	4.27%	4.16%	3.86%	3.77%	3.67%
Rights of use		332 999	341 825	349 962	358 298	366 883	375 755	384 765	394 004
	YoY Growth%	2.30%	2.65%	2.38%	2.38%	2.40%	2.42%	2.40%	2.40%
	% of total assets	9.34%	9.50%	9.64%	9.78%	9.79%	9.35%	9.36%	9.36%
Investments in jointly controlled companies and associated companies		35 318	35 318	35 318	35 318	35 318	35 318	35 318	35 318
	YoY Growth%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	% of total assets	0.99%	0.98%	0.97%	0.96%	0.94%	0.88%	0.86%	0.84%
Accounts receivable - other		6 367	6 447	6 525	6 611	6 688	6 759	6 818	6 883
	YoY Growth%	1.21%	1.26%	1.21%	1.32%	1.16%	1.07%	0.87%	0.94%
	% of total assets	0.18%	0.18%	0.18%	0.18%	0.18%	0.17%	0.17%	0.16%
Deferred income tax assets		94 027	95 246	96 418	97 708	98 856	99 928	100 816	101 780
	YoY Growth%	1.22%	1.30%	1.23%	1.34%	1.18%	1.08%	0.89%	0.96%
	% of total assets	2.64%	2.65%	2.66%	2.67%	2.64%	2.49%	2.45%	2.42%
Other non-current assets		5 915	5 915	5 915	5 915	5 915	5 915	5 915	5 915
	YoY Growth%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	% of total assets	0.17%	0.16%	0.16%	0.16%	0.16%	0.15%	0.14%	0.14%
Total non-current assets		2 984 456	3 009 658	3 034 307	3 059 679	3 136 830	3 402 348	3 487 595	3 577 751
	YoY Growth%	0.80%	0.84%	0.82%	0.84%	2.52%	8.46%	2.51%	2.59%
	% of total assets	83.71%	83.65%	83.59%	83.52%	83.70%	84.63%	84.83%	85.04%
Total non-current liabilities		185 596	186 830	187 977	189 275	190 418	191 483	192 369	193 331
	YoY Growth%	0.65%	0.67%	0.61%	0.69%	0.60%	0.56%	0.46%	0.50%
	% of total assets	5.21%	5.19%	5.18%	5.17%	5.08%	4.76%	4.68%	4.60%
Invested Capital: Group Total		2 695 638	2 717 886	2 739 333	2 761 263	2 835 121	3 097 588	3 180 206	3 267 600
	YoY Growth%	0.77%	0.83%	0.79%	0.80%	2.67%	9.26%	2.67%	2.75%
	% of total assets	75.61%	75.54%	75.46%	75.37%	75.65%	77.05%	77.36%	77.67%
Financing									
Current Financing									
Borrowings		291 043	289 066	287 114	283 393	287 591	325 529	334 893	337 818
	YoY Growth%	-0.97%	-0.68%	-0.68%	-1.30%	1.48%	13.19%	2.88%	0.87%
	% of total assets	8.16%	8.03%	7.91%	7.74%	7.67%	8.10%	8.15%	8.03%
Excess cash		49 216	49 216	49 216	49 216	49 216	49 216	49 216	49 216
	YoY Growth%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	% of total assets	1.38%	1.37%	1.36%	1.34%	1.31%	1.22%	1.20%	1.17%
Non-current Financing									
Borrowings		1 381 150	1 372 146	1 363 327	1 346 332	1 367 624	1 550 974	1 596 330	1 612 282
	YoY Growth%	-0.95%	-0.65%	-0.64%	-1.25%	1.58%	13.41%	2.92%	1.00%
	% of total assets	38.74%	38.14%	37.56%	36.75%	36.49%	38.58%	38.83%	38.32%
Total Financing		1 622 977	1 611 996	1 601 225	1 580 509	1 605 999	1 827 287	1 882 007	1 900 885
	YoY Growth%	-0.98%	-0.68%	-0.67%	-1.29%	1.61%	13.78%	2.99%	1.00%
	% of total assets	45.52%	44.80%	44.11%	43.14%	42.85%	45.45%	45.78%	45.18%
Equity									
Total Equity		1 072 661	1 105 890	1 138 108	1 180 754	1 229 122	1 270 301	1 298 199	1 366 716
	YoY Growth%	3.55%	3.10%	2.91%	3.75%	4.10%	3.35%	2.20%	5.28%
	% of total assets	30.09%	30.74%	31.35%	32.23%	32.79%	31.60%	31.58%	32.48%

Source: Group Analysis

5. Income Statement Annual incl. Forecast

Annually									
		2018	2019	2020	2021	2022	2023e	2024e	2025e
Group Total									
Total Revenues: Group Total		1 576 161	1 458 405	1 367 885	1 430 299	1 521 008	1 603 321	1 662 103	1 684 483
	YoY Growth%		-7.47%	-6.21%	4.56%	6.34%	5.41%	3.67%	1.35%
Costs, Losses and Gains:									
Wages and salaries		101 744	84 830	85 331	82 036	85 898	92 444	96 717	99 712
	YoY Growth%		-16.62%	0.59%	-3.86%	4.71%	7.62%	4.62%	3.10%
	in % of Revenue	6.46%	5.82%	6.24%	5.74%	5.65%	5.77%	5.82%	5.92%
Direct costs		636 419	384 890	348 776	375 440	345 019	370 104	420 311	425 420
	YoY Growth%		-39.52%	-9.38%	7.65%	-8.10%	7.27%	13.57%	1.22%
	in % of Revenue	40.38%	26.39%	25.50%	26.25%	22.68%	23.08%	25.29%	25.26%
Costs of products sold		76 761	64 228	74 312	99 075	114 562	98 259	99 131	101 698
	YoY Growth%		-16.33%	15.70%	33.32%	15.63%	-14.23%	0.89%	2.59%
	in % of Revenue	4.87%	4.40%	5.43%	6.93%	7.53%	6.13%	5.96%	6.04%
Marketing and advertising		43 702	37 216	24 504	28 621	34 748	37 783	36 323	36 771
	YoY Growth%		-14.84%	-34.16%	16.80%	21.41%	8.73%	-3.86%	1.23%
	in % of Revenue	2.77%	2.55%	1.79%	2.00%	2.28%	2.36%	2.19%	2.18%
Support services		103 661	82 257	86 281	84 857	83 466	91 698	93 455	91 758
	YoY Growth%		-20.65%	4.89%	-1.65%	-1.64%	9.86%	1.92%	-1.82%
	in % of Revenue	6.58%	5.64%	6.31%	5.93%	5.49%	5.72%	5.62%	5.45%
Supplies and external services		152 243	112 670	100 542	100 959	155 238	149 035	139 541	136 616
	YoY Growth%		-25.99%	-10.76%	0.41%	53.76%	-4.00%	-6.37%	-2.10%
	in % of Revenue	9.66%	7.73%	7.35%	7.06%	10.21%	9.30%	8.40%	8.11%
Other operating losses / (gains)		1 021	516	719	518	798	929	988	1 005
	YoY Growth%		-49.46%	39.34%	-27.96%	54.05%	16.45%	6.34%	1.70%
	in % of Revenue	0.06%	0.04%	0.05%	0.04%	0.05%	0.06%	0.06%	0.06%
Taxes		42 452	32 844	32 747	31 153	34 985	35 915	36 845	37 301
	YoY Growth%		-22.63%	-0.30%	-4.87%	12.30%	2.66%	2.59%	1.24%
	in % of Revenue	2.69%	2.25%	2.39%	2.18%	2.30%	2.24%	2.22%	2.21%
Provisions and Adjustments		16 519	18 983	11 493	9 679	15 233	12 734	14 031	14 193
	YoY Growth%		14.92%	-39.46%	-15.78%	57.38%	-16.40%	10.18%	1.15%
	in % of Revenue	1.05%	1.30%	0.84%	0.68%	1.00%	0.79%	0.84%	0.84%
Total Costs, Losses and Gains		1 174 522	818 434	764 705	812 338	869 947	888 900	937 342	944 472
	YoY Growth%		-30.32%	-6.56%	6.23%	7.09%	2.18%	5.45%	0.76%
	in % of Revenue	74.52%	56.12%	55.90%	56.79%	57.20%	55.44%	56.39%	56.07%
EBITDA: Group Total		401 639	639 971	603 180	617 961	651 061	714 421	724 761	740 011
	YoY Growth%		59.34%	-5.75%	2.45%	5.36%	9.73%	1.45%	2.10%
	in % of Revenue	25.48%	43.88%	44.10%	43.21%	42.80%	44.56%	43.61%	43.93%
EBIT: Group Total		- 127 691	200 748	137 309	188 657	270 209	235 723	258 503	282 835
	YoY Growth%		-257.21%	-31.60%	37.40%	43.23%	-12.76%	9.66%	9.41%
	in % of Revenue	-8.10%	13.76%	10.04%	13.19%	17.77%	14.70%	15.55%	16.79%
NOPLAT: Group Total		- 160 972	165 367	119 026	172 092	236 860	202 928	232 360	251 023
	YoY Growth%		-202.73%	-28.02%	44.58%	37.64%	-14.33%	14.50%	8.03%
	in % of Revenue	-10.21%	11.34%	8.70%	12.03%	15.57%	12.66%	13.98%	14.90%
Net Financial expense									
Net losses / (gains) of affiliated companies		5 854	1 022	9 099 -	3 601 -	22 123	5 696 -	4 186 -	4 186
	YoY Growth%		-82.54%	790.31%	-139.58%	514.36%	-74.26%	-26.50%	0.00%
	in % of Revenue	0.37%	0.07%	0.67%	-0.25%	-1.45%	-0.36%	-0.25%	-0.25%
Financial costs		31 072	20 661	22 219	34 118	31 578	69 577	85 819	71 068
	YoY Growth%		-33.51%	7.54%	53.55%	-7.44%	120.33%	23.34%	-17.19%
	in % of Revenue	1.97%	1.42%	1.62%	2.39%	2.08%	4.34%	5.16%	4.22%
Net foreign exchange losses / (gains)		- 222	119	548 -	631	224	51	42	42
Net losses / (gains) on financial assets		- 131	142	53	12	103	222	106	106
Net other financial expenses / (income)		8 651	3 825	3 813	3 123	3 319	3 624	3 541	3 541
	YoY Growth%		-55.79%	-0.31%	-18.10%	6.28%	9.20%	-2.30%	0.00%
	in % of Revenue	0.55%	0.26%	0.28%	0.22%	0.22%	0.23%	0.21%	0.21%
Total net financial expenses		45 224	25 769	35 732	33 021	13 101	67 677	85 322	70 571
	YoY Growth%		-43.02%	38.66%	-7.59%	-60.33%	416.58%	26.07%	-17.29%
	in % of Revenue	2.87%	1.77%	2.61%	2.31%	0.86%	4.22%	5.13%	4.19%
Net loss / (profit) from financing		39 425	22 945	33 791	28 239	12 415	54 942	69 727	57 848
	YoY Growth%		-41.80%	47.27%	-16.43%	-56.04%	342.54%	26.91%	-17.04%
	in % of Revenue	2.50%	1.57%	2.47%	1.97%	0.82%	3.43%	4.20%	3.43%
Net Income		- 200 397	143 251	91 643	143 853	224 445	147 986	162 633	193 175
	YoY Growth%		-171.48%	-36.03%	56.97%	56.02%	-34.07%	9.90%	18.78%
	in % of Revenue	-12.71%	9.82%	6.70%	10.06%	14.76%	9.23%	9.78%	11.47%

Source: Group Analysis

Annually									
		2026e	2027e	2028e	2029e	2030e	2031e	2032e	2033e
Group Total									
Total Revenues: Group Total		1 704 918	1 724 902	1 745 495	1 767 345	1 788 444	1 808 290	1 826 751	1 845 200
	YoY Growth%	1.21%	1.17%	1.19%	1.25%	1.19%	1.11%	1.02%	1.01%
Costs, Losses and Gains:									
Wages and salaries		102 283	104 724	107 131	109 607	112 156	114 764	117 430	120 158
	YoY Growth%	2.58%	2.39%	2.30%	2.31%	2.33%	2.32%	2.32%	2.32%
	in % of Revenue	6.00%	6.07%	6.14%	6.20%	6.27%	6.35%	6.43%	6.51%
Direct costs		430 053	434 578	439 372	444 554	449 498	454 302	458 796	463 285
	YoY Growth%	1.09%	1.05%	1.10%	1.18%	1.11%	1.07%	0.99%	0.98%
	in % of Revenue	25.22%	25.19%	25.17%	25.15%	25.13%	25.12%	25.12%	25.11%
Costs of products sold		104 021	106 217	108 343	110 502	112 706	114 463	115 971	117 508
	YoY Growth%	2.28%	2.11%	2.00%	1.99%	1.99%	1.56%	1.32%	1.33%
	in % of Revenue	6.10%	6.16%	6.21%	6.25%	6.30%	6.33%	6.35%	6.37%
Marketing and advertising		37 173	37 561	37 979	38 437	38 864	39 276	39 642	40 014
	YoY Growth%	1.09%	1.04%	1.11%	1.21%	1.11%	1.06%	0.93%	0.94%
	in % of Revenue	2.18%	2.18%	2.18%	2.17%	2.17%	2.17%	2.17%	2.17%
Support services		91 708	92 677	93 710	94 834	95 912	96 945	97 903	98 856
	YoY Growth%	-0.05%	1.06%	1.11%	1.20%	1.08%	0.99%	0.97%	0.97%
	in % of Revenue	5.38%	5.37%	5.37%	5.37%	5.36%	5.36%	5.36%	5.36%
Supplies and external services		136 452	138 014	139 636	141 366	143 035	144 611	146 076	147 539
	YoY Growth%	-0.12%	1.14%	1.18%	1.24%	1.18%	1.10%	1.01%	1.00%
	in % of Revenue	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Other operating losses / (gains)		1 021	1 039	1 055	1 072	1 088	1 102	1 115	1 129
	YoY Growth%	1.61%	1.74%	1.59%	1.52%	1.49%	1.31%	1.23%	1.24%
	in % of Revenue	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%
Taxes		37 713	38 087	38 485	38 925	39 371	39 791	40 200	40 575
	YoY Growth%	1.11%	0.99%	1.05%	1.14%	1.15%	1.07%	1.03%	0.93%
	in % of Revenue	2.21%	2.21%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Provisions and Adjustments		14 336	14 466	14 612	14 778	14 935	15 090	15 232	15 373
	YoY Growth%	1.01%	0.91%	1.01%	1.13%	1.06%	0.95%	0.93%	0.93%
	in % of Revenue	0.84%	0.84%	0.84%	0.84%	0.84%	0.83%	0.83%	0.83%
Total Costs, Losses and Gains		954 760	967 362	980 323	994 075	1 007 564	1 020 343	1 032 366	1 044 439
	YoY Growth%	1.09%	1.32%	1.34%	1.40%	1.36%	1.27%	1.18%	1.17%
	in % of Revenue	56.00%	56.08%	56.16%	56.25%	56.34%	56.43%	56.51%	56.60%
EBITDA: Group Total		750 158	757 541	765 172	773 270	780 880	787 948	794 385	800 761
	YoY Growth%	1.37%	0.98%	1.01%	1.06%	0.98%	0.91%	0.82%	0.80%
	in % of Revenue	44.00%	43.92%	43.84%	43.75%	43.66%	43.57%	43.49%	43.40%
EBIT: Group Total		302 532	318 011	331 987	344 838	352 557	349 396	339 784	326 381
	YoY Growth%	6.96%	5.12%	4.39%	3.87%	2.24%	-0.90%	-2.75%	-3.94%
	in % of Revenue	17.74%	18.44%	19.02%	19.51%	19.71%	19.32%	18.60%	17.69%
NOPLAT: Group Total		267 455	280 615	292 729	303 843	310 627	308 904	301 765	290 782
	YoY Growth%	6.55%	4.92%	4.32%	3.80%	2.23%	-0.55%	-2.31%	-3.64%
	in % of Revenue	15.69%	16.27%	16.77%	17.19%	17.37%	17.08%	16.52%	15.76%
Net Financial expense									
Net losses / (gains) of affiliated companies	-	4 186 -	4 186 -	4 186 -	4 186 -	4 186 -	4 186 -	4 186 -	4 186
	YoY Growth%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	in % of Revenue	-0.25%	-0.24%	-0.24%	-0.24%	-0.23%	-0.23%	-0.23%	-0.23%
Financial costs		68 414	68 207	69 522	70 478	71 927	78 922	86 667	90 293
	YoY Growth%	-3.73%	-0.30%	1.93%	1.37%	2.06%	9.73%	9.81%	4.18%
	in % of Revenue	4.01%	3.95%	3.98%	3.99%	4.02%	4.36%	4.74%	4.89%
Net foreign exchange losses / (gains)		42	42	42	42	42	42	42	42
Net losses / (gains) on financial assets		106	106	106	106	106	106	106	106
Net other financial expenses / (income)		3 541	3 541	3 541	3 541	3 541	3 541	3 541	3 541
	YoY Growth%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	in % of Revenue	0.21%	0.21%	0.20%	0.20%	0.20%	0.20%	0.19%	0.19%
Total net financial expenses		67 917	67 710	69 025	69 981	71 430	78 425	86 171	89 796
	YoY Growth%	-3.76%	-0.31%	1.94%	1.38%	2.07%	9.79%	9.88%	4.21%
	in % of Revenue	3.98%	3.93%	3.95%	3.96%	3.99%	4.34%	4.72%	4.87%
Net loss / (profit) from financing		55 694	55 514	56 554	57 296	58 414	63 909	70 014	72 838
	YoY Growth%	-3.72%	-0.32%	1.87%	1.31%	1.95%	9.41%	9.55%	4.03%
	in % of Revenue	3.27%	3.22%	3.24%	3.24%	3.27%	3.53%	3.83%	3.95%
Net Income		211 761	225 101	236 176	246 546	252 213	244 995	231 752	217 945
	YoY Growth%	9.62%	6.30%	4.92%	4.39%	2.30%	-2.86%	-5.41%	-5.96%
	in % of Revenue	12.42%	13.05%	13.53%	13.95%	14.10%	13.55%	12.69%	11.81%

Source: Group Analysis

6. FCFF Annualized Forecast

Annually											
	0.25	1.25	2.25	3.25	4.25	5.25	6.25	7.25	8.25	9.25	10.25
in € thousand	2023/Q4e	2024e	2025e	2026e	2027e	2028e	2029e	2030e	2031e	2032e	2033e
Telco											
Revenue	389 661	1 537 446	1 555 968	1 572 460	1 587 822	1 604 655	1 623 344	1 641 149	1 658 451	1 674 467	1 690 341
EBITDA	143 733	652 772	665 783	673 596	678 178	683 582	689 850	695 561	701 239	706 348	711 328
% margin	36.9%	42.5%	42.8%	42.8%	42.7%	42.6%	42.5%	42.4%	42.3%	42.2%	42.1%
- D&A	109 567	434 198	424 042	413 613	404 579	397 225	391 465	390 356	399 612	414 743	433 642
- Income Taxes	7 099	45 603	50 465	54 292	57 149	59 825	62 347	63 776	63 021	60 913	57 987
- Tax adjustments	- 5 421	- 25 899	- 25 401	- 26 253	- 27 134	- 28 171	- 29 112	- 29 782	- 30 556	- 31 004	- 30 611
NOPLAT	32 487	198 869	216 678	231 944	243 584	254 703	265 150	271 212	269 163	261 696	250 309
- CAPEX	105 081	377 616	356 210	350 819	351 031	353 624	357 346	436 907	501 404	550 014	586 571
% of revenue	27.0%	24.6%	22.9%	22.3%	22.1%	22.0%	22.0%	26.6%	30.2%	32.8%	34.7%
NWC	- 94 148	- 107 431	- 109 103	- 111 450	- 113 723	- 116 076	- 118 542	- 120 998	- 123 187	- 125 146	- 127 176
- Δ in NWC	- 56 919	- 13 283	- 1 672	- 2 347	- 2 273	- 2 353	- 2 467	- 2 456	- 2 189	- 1 959	- 2 031
% of revenue	-14.6%	-0.9%	-0.1%	-0.1%	-0.1%	-0.1%	-0.2%	-0.1%	-0.1%	-0.1%	-0.1%
addback: D&A	109 567	434 198	424 042	413 613	404 579	397 225	391 465	390 356	399 612	414 743	433 642
FCFF	93 893	268 735	286 182	297 084	299 405	300 657	301 735	227 116	169 559	128 385	99 411
Discounted FCFF	92 583	250 514	252 206	247 514	235 822	223 874	212 404	151 144	106 677	76 360	55 898
Audiovisuals											
Revenue	30 549	124 657	128 515	132 458	137 080	140 840	144 001	147 295	149 839	152 284	154 859
EBITDA	17 654	71 989	74 227	76 561	79 363	81 590	83 420	85 319	86 708	88 037	89 433
% margin	57.8%	57.7%	57.8%	57.8%	57.9%	57.9%	57.9%	57.9%	57.9%	57.8%	57.8%
- D&A	7 017	29 419	30 439	31 263	32 142	33 099	34 057	35 008	35 940	36 820	37 660
- Income Taxes	2 171	8 683	8 930	9 239	9 634	9 893	10 069	10 261	10 352	10 441	10 553
- Tax adjustments	- 30	- 2 243	- 2 182	- 2 202	- 2 252	- 2 289	- 2 309	- 2 325	- 2 325	- 2 332	- 2 331
NOPLAT	8 496	36 131	34 858	36 059	37 588	38 599	39 294	40 049	40 416	40 776	41 221
- CAPEX	10 721	35 501	34 179	35 072	36 285	37 280	38 117	38 989	39 662	40 309	40 991
% of revenue	35.1%	28.5%	26.6%	26.5%	26.5%	26.5%	26.5%	26.5%	26.5%	26.5%	26.5%
NWC	6 920	7 412	7 798	8 228	8 782	9 079	9 402	9 708	9 909	10 126	10 356
- Δ in NWC	1 713	492	386	430	553	297	323	306	202	216	231
% of revenue	5.6%	0.4%	0.3%	0.3%	0.4%	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%
addback: D&A	7 017	29 419	30 439	31 263	32 142	33 099	34 057	35 008	35 940	36 820	37 660
FCFF	3 080	29 557	30 731	31 820	32 891	34 121	34 911	35 763	36 492	37 070	37 659
Discounted FCFF	3 037	27 553	27 083	26 511	25 906	25 407	24 575	23 800	22 959	22 049	21 175

Source: Group Analysis

7. Revenue Forecast

Telecommunications		23Q2	23Q3	23Q4e	24Q1e	24Q2e	24Q3e	24Q4e	30Q1e	30Q2e	30Q3e	30Q4e	31Q1e	31Q2e	31Q3e	31Q4e	32Q1e	32Q2e	32Q3e	32Q4e	33Q1e	33Q2e	33Q3e	33Q4e
Services rendered		339,935	348,210	349,727	350,775	351,813	352,837	353,843	373,094	373,975	374,879	375,806	376,756	377,729	378,725	379,744	380,541	381,357	382,194	383,050	383,926	384,822	385,739	386,675
	Growth %	2.20%	2.43%	0.44%	0.30%	0.30%	0.29%	0.29%	0.23%	0.24%	0.24%	0.23%	0.23%	0.26%	0.26%	0.26%	0.21%	0.21%	0.22%	0.22%	0.23%	0.23%	0.24%	0.24%
ARPU		31.24	31.70	31.62	31.50	31.38	31.28	31.17	30.05	30.03	30.02	30.00	29.99	29.98	29.97	29.96	29.96	29.96	29.97	29.98	29.99	30.00	30.01	30.02
	Growth %	0.08%	0.95%	-0.26%	-0.38%	-0.38%	-0.32%	-0.34%	-3.74%	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Total RGU		10,880	10,985	11,062	11,137	11,211	11,282	11,350	12,416	12,453	12,490	12,527	12,564	12,601	12,639	12,676	12,702	12,727	12,752	12,778	12,803	12,829	12,855	12,881
	Growth %	0.08%	0.95%	0.70%	0.68%	0.66%	0.63%	0.61%	0.29%	0.29%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%
RGU Mobile		5,814	5,896	5,966	6,034	6,100	6,164	6,225	7,123	7,151	7,179	7,208	7,236	7,264	7,293	7,322	7,338	7,354	7,370	7,387	7,403	7,419	7,436	7,452
	Pre-Paid	2,074	2,086	2,089	2,093	2,096	2,099	2,103	2,173	2,176	2,180	2,183	2,186	2,190	2,193	2,197	2,200	2,204	2,207	2,210	2,214	2,217	2,221	2,224
	Growth %	-2.33%	0.59%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%
	Post-Paid	3,740	3,809	3,876	3,941	4,004	4,064	4,123	4,950	4,975	5,000	5,025	5,050	5,075	5,100	5,125	5,138	5,151	5,163	5,176	5,189	5,202	5,215	5,228
	Growth %	1.40%	1.85%	1.75%	1.67%	1.59%	1.51%	1.43%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
RGU Pay TV Fixed Access		1,447	1,455	1,452	1,449	1,446	1,443	1,440	1,381	1,378	1,375	1,373	1,370	1,367	1,364	1,362	1,359	1,356	1,354	1,351	1,348	1,345	1,343	1,340
	Growth %	0.38%	0.54%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%
RGU Pay TV DTH		218	214	214	213	213	212	212	203	203	202	202	201	201	201	200	200	199	199	199	198	198	197	197
	Growth %	-2.39%	-1.89%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%
RGU Fixed Voice		1,813	1,820	1,822	1,825	1,827	1,830	1,832	1,884	1,886	1,889	1,891	1,894	1,896	1,899	1,901	1,904	1,906	1,909	1,911	1,914	1,916	1,919	1,921
	Growth %	0.03%	0.38%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%
RGU Broadband		1,535	1,547	1,555	1,562	1,570	1,577	1,585	1,755	1,764	1,772	1,781	1,789	1,798	1,807	1,816	1,824	1,833	1,842	1,851	1,860	1,869	1,878	1,888
	Growth %	0.30%	0.81%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%
RGU Others and Data		53	53	54	54	55	55	56	70	71	72	73	73	74	75	76	77	77	78	79	80	81	82	83
	Growth %	1.23%	0.54%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%
Sales		22,529	21,849	33,236	22,217	22,404	22,592	33,974	25,312	25,437	25,564	38,397	25,817	25,945	26,074	38,685	26,333	26,464	26,595	38,685	26,595	26,992	27,126	38,685
	Growth %	1.01%	-3.02%	1.30%	0.84%	0.84%	0.84%	0.84%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
	Q4 effect	1.78%		49.95%	0.00%	0.00%	0.00%	49.95%	0.00%	0.00%	0.00%	49.95%	0.00%	0.00%	0.00%	49.95%	0.00%	0.00%	0.00%	49.95%	0.00%	0.00%	0.00%	49.95%
Other operating revenues		7,478	7,287	6,698	6,718	6,738	6,758	6,777	7,145	7,162	7,180	7,197	7,216	7,234	7,253	7,273	7,288	7,304	7,320	7,336	7,353	7,370	7,388	7,406
	% of services rendered	2.20%	2.09%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%

Audiovisuals		23Q2	23Q3	23Q4e	24Q1e	24Q2e	24Q3e	24Q4e	30Q1e	30Q2e	30Q3e	30Q4e	31Q1e	31Q2e	31Q3e	31Q4e	32Q1e	32Q2e	32Q3e	32Q4e	33Q1e	33Q2e	33Q3e	33Q4e
Services rendered		19,486	24,749	25,000	25,184	25,375	25,574	25,782	29,742	29,922	30,105	30,230	30,357	30,486	30,617	30,750	30,884	31,021	31,160	31,301	31,443	31,588	31,734	31,883
	Growth %	16.06%	27.01%	1.02%	0.73%	0.76%	0.79%	0.81%	0.60%	0.60%	0.61%	0.42%	0.42%	0.42%	0.43%	0.43%	0.44%	0.44%	0.45%	0.45%	0.46%	0.46%	0.46%	0.47%
Sales		4,190	5,455	5,231	5,293	5,335	5,387	5,440	6,398	6,430	6,462	6,478	6,494	6,511	6,527	6,543	6,559	6,576	6,592	6,608	6,625	6,641	6,658	6,674
	Growth %	34.66%	30.19%	-4.11%	0.99%	0.99%	0.99%	0.99%	0.50%	0.50%	0.50%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
	Sales per ticket	2.06	1.94	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84
Other operating revenues		174	367	318	321	323	326	328	379	381	383	385	386	388	390	391	393	395	397	398	400	402	404	406
	Growth %	770.00%	110.92%	-13.29%	0.73%	0.76%	0.79%	0.81%	0.60%	0.60%	0.61%	0.42%	0.42%	0.42%	0.43%	0.43%	0.44%	0.44%	0.45%	0.45%	0.46%	0.46%	0.46%	0.47%
	% of Services rendered	0.89%	1.48%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%	1.27%
Total Audiovisuals Revenues		23,850	30,571	30,549	30,787	31,033	31,287	31,550	36,519	36,733	36,950	37,093	37,238	37,384	37,533	37,684	37,837	37,992	38,148	38,307	38,468	38,631	38,796	38,963
	Growth %	20.19%	28.16%	-0.07%	0.76%	0.80%	0.82%	0.84%	0.59%	0.59%	0.59%	0.39%	0.39%	0.39%	0.40%	0.40%	0.41%	0.41%	0.41%	0.42%	0.42%	0.43%	0.43%	0.43%

ARPU adj. by bundles		23Q2	23Q3	23Q4e	24Q1e	24Q2e	24Q3e	24Q4e	30Q1e	30Q2e	30Q3e	30Q4e	31Q1e	31Q2e	31Q3e	31Q4e	32Q1e	32Q2e	32Q3e	32Q4e	33Q1e	33Q2e	33Q3e	33Q4e
ARPU (Brutto)		41.61	41.54	41.47	41.36	41.26	41.16	41.07	40.21	40.20	40.20	40.20	40.20	40.20	40.20	40.21	40.22	40.24	40.26	40.28	40.30	40.32	40.34	40.37
Discounts		-10.37	-9.84	-9.85	-9.86	-9.88	-9.89	-9.90	-10.16	-10.17	-10.18	-10.20	-10.21	-10.22	-10.24	-10.25	-10.26	-10.27	-10.29	-10.30	-10.31	-10.32	-10.34	-10.35
	Growth %	-5.96%	-5.11%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%
ARPU (Netto after Discounts)		31.24	31.70	31.62	31.50	31.38	31.28	31.17	30.05	30.03	30.02	30.00	29.99	29.98	29.97	29.96	29.96	29.96	29.97	29.98	29.99	30.00	30.01	30.02
	Growth %	2.12%	1.46%	-0.27%	-0.38%	-0.36%	-0.34%	-0.32%	-0.06%	-0.06%	-0.05%	-0.05%	-0.04%	-0.04%	-0.03%	-0.03%	0.01%	0.02%	0.02%	0.02%	0.03%	0.03%	0.04%	0.04%
Total RGU		10,880	10,985	11,062	11,137	11,211	11,282	11,350	12,416	12,453	12,490	12,527	12,564	12,601	12,639	12,676	12,702	12,727	12,752	12,778	12,803	12,829	12,855	12,881
Mobile		5,814	5,896	5,966	6,034	6,100	6,164	6,225	7,123	7,151	7,179	7,208	7,236	7,264	7,293	7,322	7,338	7,354	7,370	7,387	7,403	7,419	7,436	7,452
	RGU Pre-Paid	2,074	2,086	2,089	2,093	2,096	2,099	2,103	2,173	2,176	2,180	2,183	2,186	2,190	2,193	2,197	2,200	2,204	2,207	2,210	2,214	2,217	2,221	2,224
	Price Pre-Paid	30	30	30	30	30	30	30	32	32	32	32	33	33	33	33	33	33	33	33	33	33	33	34
	RGU Post-Paid	3,740	3,809	3,876	3,941	4,004	4,064	4,123	4,950	4,975	5,000	5,025	5,050	5,075	5,100	5,125	5,138	5,151	5,163	5,176	5,189	5,202	5,215	5,228
	Price Post-Paid	27	27	27	27	27	27	27	29	29	29	29	29	29	29	30	30	30	30	30	30	30	30	30
RGU Pay TV Fixed Access		1,447	1,455	1,452	1,449	1,446	1,443	1,440	1,381	1,378	1,375	1,373	1,370	1,367	1,364	1,362	1,359	1,356	1,354	1,351	1,348	1,345	1,343	1,340
	Price Pay TV Fixed Access	99	99	98	98	97	97	96	85	85	84	84	83	83	82	82	81	80	80	79	79	79	78	78
	G																							

8. Yield Curve Estimation

a.) Gov. Yield Curve + Market Spread BBB-Bonds

Maturity in Y	DE Gov. ▼	EU Com. BBB- ▼	Market Spread	PT Gov. ▼	NOS
0.25	3.775%	3.920%	0.15%	3.449%	3.59%
0.5	3.766%	3.968%	0.20%	2.956%	3.16%
1	3.646%	4.077%	0.43%	3.563%	3.99%
2	3.006%	4.162%	1.16%	3.020%	4.18%
3	2.778%	4.087%	1.31%	2.883%	4.19%
4	2.643%	4.054%	1.41%	2.948%	4.36%
5	2.623%	4.052%	1.43%	3.009%	4.44%
6	2.608%	4.063%	1.46%	3.073%	4.53%
7	2.641%	4.068%	1.43%	3.151%	4.58%
8	2.618%	4.108%	1.49%	3.210%	4.70%
9	2.667%	4.138%	1.47%	3.314%	4.79%
10	2.737%	4.170%	1.43%	3.428%	4.86%

	BPI (1)	PTNOSCOM0011	Medio Banco	BPI (2)	PTNOSEOM0019	BPI (3)	BPI (4)	PTNOSKOM0003
Maturity in y	0.65	0.70	0.74	2.74	3.40	3.40	4.23	4.48
YTM	3.14%	3.49%	3.55%	4.19%	4.26%	4.26%	4.38%	4.40%

b.) Gov. Yield Curve + Synthetic Credit Rating Spread: S&P

S&P Ratings	Default spread in bp
A1	75.44
A2	90.52
A3	128.24
Aa1	42.75
Aa2	52.81
Aa3	64.12
Aaa	0.00
B1	481.54
B2	588.41
B3	695.28
Ba1	267.80
Ba2	321.87
Ba3	384.73
Baa1	170.99
Baa2	203.68
Baa3	235.11
C	1750.00
Ca	1283.69
Caa1	802.15
Caa2	963.08
Caa3	1069.95
NR	NA

Maturity in Y	PT Gov. Yield	Market Spread	NOS
0.25	3.45%	2.35%	5.80%
0.5	2.96%	2.35%	5.31%
1	3.56%	2.35%	5.91%
2	3.02%	2.35%	5.37%
3	2.88%	2.35%	5.23%
4	2.95%	2.35%	5.30%
5	3.01%	2.35%	5.36%
6	3.07%	2.35%	5.42%
7	3.15%	2.35%	5.50%
8	3.21%	2.35%	5.56%
9	3.31%	2.35%	5.67%
10	3.43%	2.35%	5.78%

	BPI (1)	PTNOSCOM0011	Medio Banco	BPI (2)	PTNOSEOM0019	BPI (3)	BPI (4)	PTNOSKOM0003
Maturity in y	0.65	0.70	0.74	2.74	3.40	3.40	4.23	4.48
YTM	5.49%	5.55%	5.59%	5.27%	5.26%	5.26%	5.31%	5.33%

c.) Gov. Yield Curve + Synthetic Credit Rating Spread: ICR

Interest Coverage Ratio >	<	Rating	Spread
-100000.00	0.199999	D2/D	20.00%
0.20	0.649999	C2/C	17.50%
0.65	0.799999	Ca2/CC	15.78%
0.80	1.249999	Caa/CCC	11.57%
1.25	1.499999	B3/B-	7.37%
1.50	1.749999	B2/B	5.26%
1.75	1.999999	B1/B+	4.55%
2.00	2.249999	Ba2/BB	3.13%
2.25	2.499999	Ba1/BB+	2.42%
2.50	2.999999	Baa2/BBB	2.00%
3.00	4.249999	A3/A-	1.62%
4.25	5.499999	A2/A	1.42%
5.50	6.499999	A1/A+	1.23%
6.50	8.499999	Aa2/AA	0.85%
8.50	100000.000000	Aaa/ AAA	0.69%

EBIT	230,840
Interest Expenses	53,042
Interest Coverage Ratio TTM	4.35 A2/A 1.42%

Maturity in Y	PT Gov. Yield	Market Spread	NOS
0.25	3.45%	1.42%	4.87%
0.5	2.96%	1.42%	4.38%
1	3.56%	1.42%	4.98%
2	3.02%	1.42%	4.44%
3	2.88%	1.42%	4.30%
4	2.95%	1.42%	4.37%
5	3.01%	1.42%	4.43%
6	3.07%	1.42%	4.49%
7	3.15%	1.42%	4.57%
8	3.21%	1.42%	4.63%
9	3.31%	1.42%	4.73%
10	3.43%	1.42%	4.85%

	BPI (1)	PTNOSCOM0011	Medio Banco	BPI (2)	PTNOSEOM0019	BPI (3)	BPI (4)	PTNOSKOM0003
Maturity in y	0.65	0.70	0.74	2.74	3.40	3.40	4.23	4.48
YTM	4.56%	4.62%	4.66%	4.34%	4.33%	4.33%	4.38%	4.40%

Source: Group Analysis & Bloomberg

9. Bonds Overview

	PTNOSCOM0011				PTNOSEOM0019				PTNOSKOM0003		w. Average
Placed by	BPI (1)	C. G. de Depositos	Medio Banco	BPI (2)	C. G. de Depositos	BPI (3)	BPI (4)	C. G. de Depositos			
Issuance Date	30.06.2019	18.07.2019	31.07.2019	31.07.2019	31.03.2022	31.07.2022	27.04.2023	27.04.2023			
Maturity Date	30.06.2024	18.07.2024	31.07.2024	31.07.2026	31.03.2027	31.03.2027	27.01.2028	27.04.2028			
Maturity in Y	0.65	0.70	0.74	2.74	3.40	3.40	4.23	4.48			2.75
Last Coupon Payment		18.07.2023			29.09.2023			27.10.2023			
Next Coupon Payment		18.01.2024			28.03.2024			27.04.2024			
EURIBOR 6M + Spread	unknown	0.70%	unkown	unkown	0.95%	unkown	unkown	0.94%			
Next Coupon	-	4.461%	-	-	5.086%	-	-	4.575%			
Face Value	100 €	100 €	100 €	100 €	100 €	100 €	100 €	100 €			
Notional [Outstanding Debt]	50,000 €	50,000 €	25,000 €	15,000 €	75,000 €	75,000 €	50,000 €	75,000 €			
a.) PT Yield Curve + Market Spread BBB- Bonds	3.14%	3.49%	3.55%	4.19%	4.26%	4.26%	4.38%	4.40%			4.00%
NPV Notional	49,006 €	48,813 €	24,366 €	13,407 €	65,076 €	65,076 €	41,722 €	61,864 €			
b.) PT Yield Curve + Synthetic Credit Rating Spread	5.49%	5.55%	5.59%	5.27%	5.26%	5.26%	5.31%	5.33%			5.37%
NPV Notional	48,293 €	48,145 €	24,018 €	13,033 €	62,994 €	62,994 €	40,178 €	59,453 €			
c.) PT Yield Curve + Synthetic Credit Rating Spread	4.56%	4.62%	4.66%	4.34%	4.33%	4.33%	4.38%	4.40%			4.44%
NPV Notional	48,572 €	48,444 €	24,175 €	13,354 €	64,928 €	64,928 €	41,714 €	61,863 €			

Source: Group Analysis & Bloomberg

10. Credit Ratings

a.) S&P

Current Credit Rating	BBB-
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b.) Altman Z-Score

Z"-Score Threshold	Rating	Area
>8.15	AAA	Safe Area
8.15	AA+	
7.60	AA	
7.30	AA-	
7.00	A+	
6.85	A	
6.65	A-	
6.40	BBB+	
6.25	BBB	
5.85	BBB-	Grey Area
5.65	BB+	
5.25	BB	
4.95	BB-	
4.75	B+	Distress Area
4.40	B	
4.15	B-	
3.75	CCC+	
3.20	CCC	
2.50	CCC-	
1.75	D	

Factor	Weights	0	4	8	12	16	20	
(Current Assets - Current Liabilities) / Total Assets	1.20	-0.01	-0.02	-0.03	-0.03	-0.02	-0.03	-0.01
Retained Earnings / Total Assets	1.40	0.34	0.32	0.29	0.29	0.32	0.25	-0.02
EBIT / Total Assets	3.30	-0.04	0.07	0.05	0.06	0.08	0.07	0.07
MV Equity / Total Liabilities	0.60	2.09	1.81	0.96	1.11	1.18	1.03	1.00
Sales / Total Assets	0.99	0.52	0.47	0.45	0.44	0.44	0.46	0.45
Z"-Score		2.09	2.19	1.54	1.66	1.83	1.62	1.23
Implied Credit Rating		CCC-	CCC-	D	D	CCC-	D	D

Current Implied Credit Rating	D
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c.) Interest Coverage Ratio

Current Rating	A2/A
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Source: Group Analysis & Bloomberg

11. Estimation of Default Probabilities

a.) Historical Approach: Global Corp. Avg. Cum. Default Rates (1981-2021)

Rating	1	2	3	4	5	6	7	8	9	10
AAA	0.00%	0.03%	0.13%	0.24%	0.34%	0.45%	0.50%	0.58%	0.64%	0.69%
AA	0.02%	0.06%	0.11%	0.20%	0.30%	0.40%	0.48%	0.55%	0.62%	0.68%
A	0.05%	0.13%	0.21%	0.32%	0.44%	0.57%	0.73%	0.87%	1.01%	1.15%
BBB	0.15%	0.41%	0.72%	1.09%	1.48%	1.85%	2.18%	2.50%	2.80%	3.10%
BB	0.60%	1.88%	3.35%	4.81%	6.19%	7.47%	8.57%	9.56%	10.45%	11.24%
B	3.18%	7.46%	11.26%	14.30%	16.67%	18.59%	20.10%	21.34%	22.45%	23.50%
CCC/C	26.55%	36.74%	41.80%	44.74%	46.91%	47.95%	49.08%	49.82%	50.48%	51.05%
Investment-grade	0.08%	0.23%	0.40%	0.61%	0.83%	1.05%	1.26%	1.45%	1.63%	1.81%
Speculative-grade	3.60%	6.97%	9.86%	12.23%	14.16%	15.75%	17.06%	18.16%	19.14%	20.04%
All rated	1.50%	2.93%	4.17%	5.22%	6.10%	6.83%	7.45%	7.97%	8.43%	8.86%

1.) Rating: Altman Z' Score:

Rating	D
Years	2.75
Default Probability low in years	2.00
Default Probability high in years	3.00
Default Probability low	36.74%
Default Probability high	41.80%
Default Probability weighted	40.55%
Annualized Default Probability	13.16%

2.) Rating: S&P

Rating	BBB-
Years	2.75
Default Probability low in years	2.00
Default Probability high in years	3.00
Default Probability low	0.41%
Default Probability high	0.72%
Default Probability weighted	0.64%
Annualized Default Probability	0.23%

3.) Rating: Interest Coverage Ratio

Rating	A2/A
Years	2.75
Default Probability low in years	2.00
Default Probability high in years	3.00
Default Probability low	0.13%
Default Probability high	0.21%
Default Probability weighted	0.19%
Annualized Default Probability	0.07%

Source: Group Analysis & Bloomberg & (S&P Global 2022)

12. Beta Unlevered vs. Beta Relevered

Company	Country based	Raw Beta	Adjusted Beta	D/E	Tax Rate	Beta UL	Beta RL
BT Group plc	United Kingdom	0.99500	0.99667	182.89%	25%	0.4202	0.8194
Digi Communications NV	Romania	0.65200	0.76800	264.54%	16%	0.2383	0.8703
Elisa OYJ	Finland	0.55000	0.70000	141.14%	20%	0.3288	0.8477
Freenet AG	Germany	0.99700	0.99800	65.27%	30%	0.6850	0.7912
Hellenic Telecommunications Organization SA	Greece	0.64700	0.76467	67.74%	22%	0.5003	0.8364
Koninklijke KPN NV	Netherlands	1.18600	1.12400	199.21%	26%	0.4536	0.8149
Liberty Global PLC	United Kingdom	0.34300	0.56200	81.04%	25%	0.3495	0.8194
Orange SA	France	0.30600	0.53733	133.81%	25%	0.2682	0.8194
Proximus NV	Belgium	0.54600	0.69733	106.92%	25%	0.3870	0.8194
Swisscom AG	Switzerland	0.25900	0.50600	70.86%	21%	0.3244	0.8420
TELE2 AB	Sweden	0.37800	0.58533	150.60%	21%	0.2666	0.8443
Telecom Italia SPA	Italy	1.28100	1.18733	172.16%	24%	0.5143	0.8251
Telefonica SA	Spain	0.75600	0.83733	142.55%	25%	0.4047	0.8194
Telekom Austria AG	Austria	0.46700	0.64467	71.01%	24%	0.4187	0.8251
Telia Company AB	Sweden	0.35500	0.57000	152.05%	21%	0.2582	0.8443
Vodafone Group	United Kingdom	0.63300	0.75533	102.96%	25%	0.4262	0.8194
Median		0.5915	0.7277	1.3747	0.2450	0.3958	0.8223
Average		0.6469	0.7646	1.3155	0.2338	0.3903	0.8286
NOS	Portugal	0.48700	0.65800	187.67%	21%	0.2650	0.8420

Estimation of Relevered Equity Beta

	2023/Q3	2023/Q4
Total Debt	1,775,202	1,950,101
Total Equity	945,947	1,366,716
D/E Ratio	1.88	1.43

Levered Beta	0.8420	TRUE
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Source: Group Analysis & Bloomberg

13. Estimation of Default Spread/ Country Risk Premium

Estimating a default spread for a country or sovereign entity

Market Based estimates

Sovereign Bond spread

1. Find a bond issued by the country, denominated in US\$ or Euros.
2. Compute the default spread by comparing to US treasury bond (if US \$) or German Euro bond (if Euros).

CDS Market

1. Find a 10-year CDS for the country (if one exists)
2. Net out US CDS
3. This is your default spread.

Country	\$ Bond Rate	US T. Bond	Default Spread	Sovereign CDS
Brazil	6.26%	3.80%	2.46%	2.88%
Indonesia	5.00%	3.80%	1.20%	1.50%
Hungary	NA	NA	NA	2.02%
Nigeria	NA	NA	NA	7.50%

Rating/Risk score based estimates

Step 1: Find a sovereign rating (local currency) for the country (on Moody's or S&P)

Step 2: Look up the default spread for that rating in the lookup table below:

Moody's Rating	Spread
Aaa	0.00%
Aa1	0.43%
Aa2	0.53%
Aa3	0.64%
A1	0.75%
A2	0.91%
A3	1.28%
Baa1	1.71%
Baa2	2.04%
Baa3	2.35%
Ba1	2.68%
Ba2	3.22%
Ba3	3.85%
B1	4.82%
B2	5.88%
B3	6.95%
Caa1	8.02%
Caa2	9.63%
Caa3	10.70%
Ca1	12.84%
Ca2	15.00%
Ca3	16.50%
C1	17.50%
C2	19.00%
C3	20.00%

Country	Rating	Rating-based Spread
Brazil	Ba2	3.22%
Indonesia	Baa2	2.04%
Hungary	Baa2	2.04%
Nigeria	Caa1	8.02%

Note: Table doesn't contain the most updated numbers.

Source: Group Analysis & (Damodaran, Country default Spreads and Risk Premiums 2023)

14. Market risk premiums**a.) Market Risk Premium - STOXX Europe 600:**

Market Return: 10Y STOXX Europe 600 Total Return	6.76%
Risk-free rate: 10Y Bund-Yield	2.74%
Risk Premium: Market	4.02%
Risk Premium: Country	2.04%
Risk Premium: Total	6.06%
Equity Beta	0.84
Cost of Equity	7.84%
Cost of Debt	3.85%
Total Debt	1,775,202
Number of Shares Outstanding	511,424,977
Last Close Price	3.51
Total Equity (Market Value)	1,795,102
Tax Rate	21.00%
WACC	5.46%

b.) Implied Market Risk Premium - STOXX Europe 600:

Current Price	443.52
Growth Rate in Earnings per Share Estimate	2.91%
EPS Current	37.84
EPS Estimate 12M+2Y	41.24
Dividend per Share Estimate 12M+2Y	20.44
Implied Required Market Return (RoE)	7.52%
Risk Premium: Market	4.78%
Risk Premium: Country	2.04%
Risk Premium: Total	6.82%
Risk-free rate: 10Y Bund-Yield	2.74%
Equity Beta	0.84
Cost of Equity	8.48%
Cost of Debt	3.85%
Total Debt	1,775,202
Total Equity	1,795,102
Tax Rate	21.00%
WACC	5.78%

c.) CRP - Default Spreads: Synthetic Rating

Risk Premium: Market	4.78%
Risk Premium: Country - Synthetic Approach	2.04%
Risk Premium: Total	6.82%
Risk-free rate: 10Y Bund-Yield	2.74%
Equity Beta	0.84
Cost of Equity	8.48%
Cost of Debt	3.85%
Total Debt	1,775,202
Total Equity	1,795,102
Tax Rate	21.00%
WACC	5.78%

d.) CRP - Default Spreads: Market Approach

Risk Premium: Market	4.78%
Risk Premium: Country - Market Approach	
a.) Credit Default Swap Spread:	0.45%
10Y CDS Portugal	0.79%
10Y CDS Germany	0.33%
b.) Bond Default Spread: 10Y PT - 10Y DE	0.69%
10Y Gov. Bond Yield Portugal	3.43%
10Y Gov. Bond Yield Germany	2.74%
Risk Premium Total	5.47%
Risk-free rate: 10Y Bund-Yield	2.74%
Equity Beta	0.84
Cost of Equity	7.35%
Cost of Debt	3.85%
Total Debt	1,775,202
Total Equity	1,795,102
Tax Rate	21.00%
WACC	5.21%

e.) CRP - Equity Market Volatility:

Risk Premium: Market	4.78%
Risk Premium: Country - Equity Market Volatility	
Volatility PSI 20 10Y TR	18.09%
Volatility STOXX Europe 600 10Y TR	16.50%
Relative Standard Deviation	109.67%
Risk Premium: Country	0.46%
Risk Premium: Total	5.24%
Risk-free rate: 10Y Bund-Yield	2.74%
Equity Beta	0.84
Cost of Equity	7.15%
Cost of Debt	3.85%
Total Debt	1,775,202
Total Equity (Market Value)	1,795,102
Tax Rate	21.00%
WACC	5.11%

f.) CRP - Modified Historical Risk Premium

Risk Premium: Market	4.78%
Risk Premium Country - Modified Historical Risk Premium	
Corporate Bond Spread	0.69%
Volatility PSI 20 10Y PR	18.09%
Volatility PT Gov. Bond 10Y	5.71%
CRP: Modified Historical Risk Premium	2.19%
Market Risk Premium	6.97%
Risk-free rate: 10Y Bund-Yield	2.74%
Equity Beta	0.84
Cost of Equity	8.61%
Cost of Debt	3.85%
Total Debt	1,775,202
Total Equity (Market Value)	1,795,102
Tax Rate	21.00%
WACC	5.84%

Source: Group Analysis & Bloomberg

„CFA Research Challenge – WACC Equity Valuation – WACC Era Perspective, Enhancing Equity Valuation through Monte Carlo Simulations”

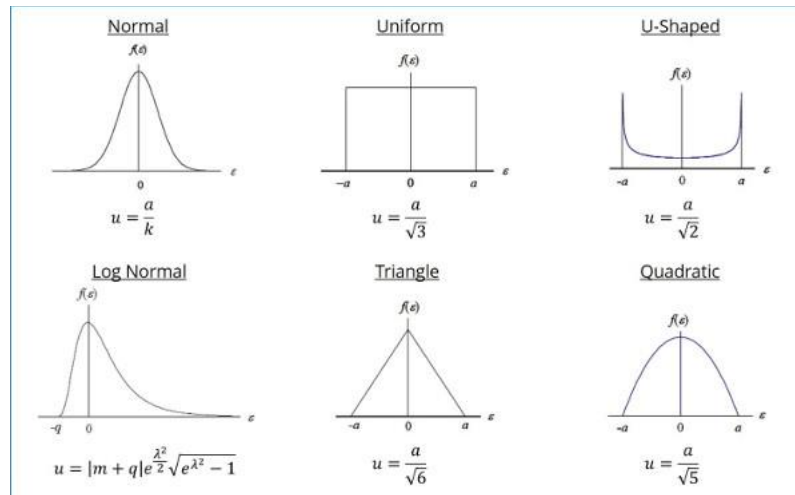
15. Comparables Companies Analysis

NOS SGPS - Comparable Companies			
Current Share Price (€)	3.51		
Valuation Date	06.11.2023		
Ticker	Company Name	Country	Equity Value (in thousand €)
SCMN.S	Swisscom AG	Switzerland	27,730,320
ORAN.PA	Orange SA	France	29,526,628
VOD.L	Vodafone Group	United Kingdom	24,593,372
TEF.MC	Telefonica	Spain	21,420,457
KPN.AS	Koninklijke KPN	Netherlands	12,592,263
ELISA.HE	Elisa OYJ	Finland	7,046,480
TELIA.ST	Telia Company AB	Sweden	8,279,207
LBTYA.OQ	Liberty Global PLC	United Kingdom	6,019,342
TLIT.MI	Telecom Italia	Italy	5,360,672
OTEr.AT	Hellenic Telecommunications Organization	Greece	5,916,316
TELA.VI	Telekom Austria	Austria	4,485,375
TEL2b.ST	TELE2 AB	Sweden	4,860,961
FNTGn.DE	Freenet AG	Germany	2,910,687
DIGI.BX	Digi Communications NV	Romania	781,637
Min			781,637
25th Percentile			4,985,889
Median			6,532,911
75th Percentile			19,213,408
Max			29,526,628
Average			11,537,408

10.2 Appendix: Jakub Zogata

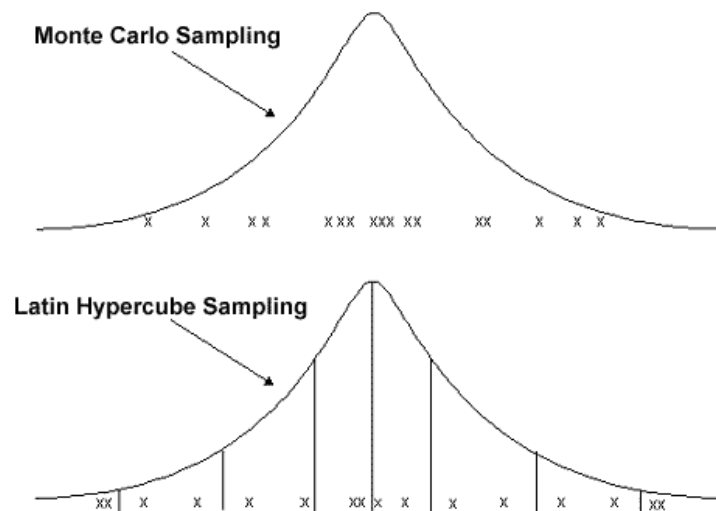
10.2.1 Appendix A

Exhibit 1 – Probability Distributions



Source: Hogan (2015)

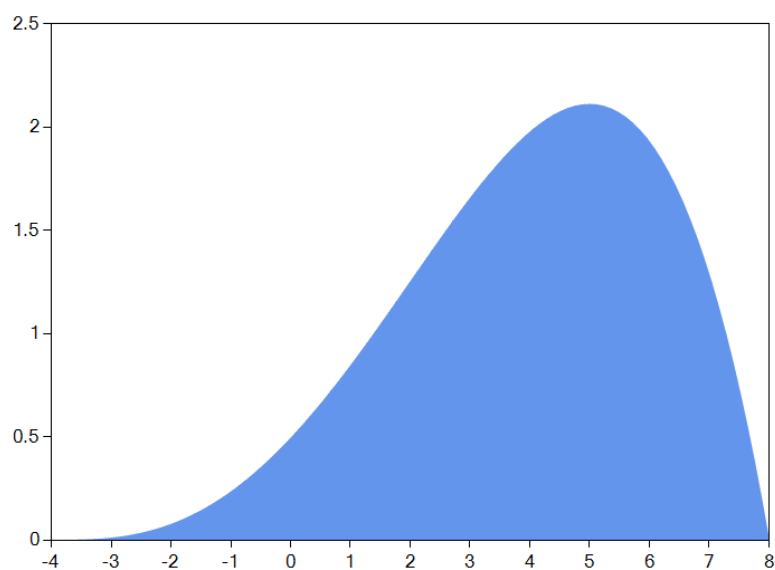
Exhibit 2 – Monte Carlo Sampling vs. Latin Hyper Cube Sampling



Source: Corbin et al. (2005)

Exhibit 3 – Telco Revenue Growth Rate Beta Distribution

„CFA Research Challenge – NOS Equity Valuation – A 5G Era Perspective; Enhancing Equity Valuation through Monte Carlo Simulations”



Source: Argo Add-in

Exhibit 5 – Bloomberg WACC

WACC History 3 Months Ending	AVERAGE	Q3 2023 09/30/2023	Q2 2023 06/30/2023	Q1 2023 03/31/2023	Q4 2022 12/31/2022	Q3 2022 09/30/2022	Q2 2022 06/30/2022	Q1 2022 03/31/2022	Q4 2021 12/31/2021	Q3 2021 09/30/2021	Q2 2021 06/30/2021	Q1 2021 03/31/2021
Equity												
Cost of Equity	8.91	6.97	7.71	8.68	10.29	9.93	9.02	9.26	8.77	8.20	7.93	8.99
Weight of Equity		50.26	47.82	53.02	59.12	49.97	53.82	45.60	56.17	54.71	50.89	52.51
+ Debt												
Cost of Debt	1.84	3.96	3.90	3.71	4.22	3.82	3.01	1.96	0.60	0.40	0.45	0.25
Weight of Debt		49.74	52.18	46.98	40.88	50.03	46.18	54.40	43.83	45.29	49.11	47.49
+ Preferred Equity												
Cost of Pref. Equity		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Weight of Pref. Equity		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WACC	5.99	5.47	5.72	6.35	7.81	6.87	6.25	5.29	5.19	4.67	4.25	4.84

Source: Bloomberg (2023)

Exhibit 6 – Correlation between CAPEX and Effective Tax

	19Q1 Restated	19Q2 Restated	19Q3 Restated	19Q4 Restated	20Q1	20Q2	20Q3	20Q4	21Q1	21Q2	21Q3	21Q4	22Q1	22Q2	22Q3	22Q4
Capex Telco	81740	110892	93784	103934	92754	87870	103290	168961	95703	110352	116805	266068	132688	128651	136829	198698
Effective tax Telco	18%	21%	25%	331%	16%	17%	9%	12%	19%	-7%	16%	-39%	12%	6%	16%	-1%
Correlation	-0.28															

Source: Own Analysis

Exhibit 8 – Base Case Scenario

The Telco Cash Flows						
	Revenues	Operating Margin %	EBIT	EBIT (1-t)	Reinvestment	FCFF
2023	1,504,892 €	18.00%	270,880 €	229,118.60 €	82,482.70 €	146,636 €
2024	1,557,563 €	18.00%	280,361 €	237,137.75 €	85,369.59 €	151,768 €
2025	1,604,290 €	18.00%	288,772 €	244,251.88 €	87,930.68 €	156,321 €
2026	1,652,418 €	18.00%	297,435 €	251,579.44 €	90,568.60 €	161,011 €
2027	1,701,991 €	18.00%	306,358 €	279,736.13 €	100,705.01 €	179,031 €
2028	1,736,031 €	18.00%	312,486 €	285,330.85 €	142,608.36 €	142,722 €
2029	1,770,751 €	18.00%	318,735 €	291,037.47 €	145,460.53 €	145,577 €
2030	1,806,166 €	18.00%	325,110 €	296,858.22 €	148,369.74 €	148,488 €
2031	1,842,290 €	18.00%	331,612 €	280,487.21 €	100,975.39 €	179,512 €
2032	1,879,136 €	18.00%	338,244 €	286,096.95 €	102,994.90 €	183,102 €
2033	1,916,718 €	18.00%	345,009 €	291,818.89 €	105,054.80 €	186,764 €
2034	1,955,053 €	18.00%	351,909 €	297,655.27 €	107,155.90 €	190,499 €
Terminal year						194,309 €
The Value of Telco						
Terminal value			4,268,283.9 €			
PV(Terminal value)			2,017,346.8 €			
PV (CF over next 10 years)			1,323,071.8 €			
- Debt & Minority Interests			1,565,809.8 €			
+ Cash & Other Non-operating assets			12,409.6 €			
Value of Telco Equity			1,787,018.4 €			
Value of Audiovisuals Equity			123,182.5 €			
Number of shares			515,161	NOS-PT market consensus	4.08 €	
Value per share			3.71 €	Stock was trading at =	4.20 €	

Source: Own Analysis

Exhibit 9 – Monte Carlo iteration example

The Telco Cash Flows						
	Revenues	Operating Margin %	EBIT	EBIT (1-t)	Reinvestment	FCFF
2023	1,515,739 €	19.93%	302,051 €	264,142.11 €	107,079.52 €	157,063 €
2024	1,596,703 €	16.69%	266,563 €	233,105.53 €	94,493.19 €	138,612 €
2025	1,673,654 €	16.26%	272,197 €	238,039.59 €	96,503.20 €	141,536 €
2026	1,782,095 €	14.52%	258,833 €	226,344.99 €	91,754.98 €	134,590 €
2027	1,872,384 €	19.61%	367,084 €	321,023.01 €	130,136.94 €	190,886 €
2028	1,946,193 €	18.11%	352,466 €	308,241.70 €	124,958.24 €	183,283 €
2029	1,923,033 €	15.08%	289,945 €	253,564.09 €	102,792.21 €	150,772 €
2030	2,033,241 €	16.45%	334,395 €	292,440.58 €	118,556.68 €	173,884 €
2031	2,174,613 €	17.47%	379,832 €	332,176.55 €	134,652.49 €	197,524 €
2032	2,218,442 €	16.59%	368,020 €	321,831.08 €	130,459.32 €	191,372 €
2033	2,355,780 €	17.36%	409,017 €	357,677.50 €	145,000.12 €	212,677 €
2034	2,397,389 €	14.85%	356,001 €	311,322.47 €	126,215.73 €	185,107 €
Terminal year						188,809 €
The Value of Telco						
Terminal value			4,147,457.9 €			
PV(Terminal value)			1,960,240.0 €			
PV (CF over next 10 years)			1,378,729.2 €			
- Debt & Minority Interests			1,565,809.8 €			
+ Cash & Other Non-operating assets			12,409.6 €			
Value of telco equity			1,785,569.1 €			
Value of Audiovisuals equity			113,526.2 €	Valuation date	3/14/2023	
Number of shares			515,161	NOS-PT market consensus	4.08 €	
Value per share			3.69 €	Stock was trading at =	4.20 €	

Source: Own Analysis

Exhibit 11 – Fair Value Range

10 000 Iteration Simulation			
30th Percentile	Mean	70th Percentile	
€ 3.53	€ 3.90	€ 4.22	

Source: Own Analysis

10.2.2 Appendix B

Description of Excel Add-In Argo:

Argo, an Excel add-In developed by Simulation Vanguard, serves as a dynamic simulation tool designed to aid decision-making processes and can be downloaded for windows at <https://boozallen.github.io/argo/>. This open-source tool enables decision makers to explore trade-off scenarios and assess potential decision strategies directly within the Excel environment. Argo's development is grounded in Simulation Research and Development (R&D), emphasizing practical application for improved decision support. The tool is provided free of charge with the intention of becoming an open-source platform for spreadsheet-based risk analysis and decision support. Argo seamlessly integrates with Excel, allowing users to incorporate dynamic simulations into existing spreadsheets or create new analyses without leaving the familiar spreadsheet environment. The tool prioritizes user-friendliness, featuring intuitive interfaces for selecting model inputs and exploring simulation results. This design simplifies the process of defining inputs and conducting analyses directly within Excel. Argo is also compatible with Excel's built-in charting and analysis features, including Solver, enhancing its utility by allowing users to leverage established Excel functionalities in conjunction with dynamic simulations. In summary, Argo is a practical and accessible tool that decision makers can use to implement dynamic simulations within Excel, providing support for risk analysis and decision-making processes.

11 References

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11.2 References Jakub Zogata:

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