

A Work Project, presented as part of the requirements for the Award of a Master's degree in  
Finance from the Nova School of Business and Economics.

OSRAM TAKEOVER BATTLE:  
STOCK MARKET REACTIONS ON AMS' ACQUISITION OF OSRAM

GUILHERME LUIS DE CARVALHO PINTO RAMALHO

Work project carried out under the supervision of:

Rui Silva

Euclides Major

20/12/2023

## Abstract

Departing from October 5th, right after AMS's second tender offer failed, this case examines the strategic acquisition of OSRAM by AMS, following a competitive bidding war involving Bain Capital, The Carlyle Group, and Advent Capital. Its primary purpose is to understand the reasoning behind AMS's bid and to assess whether a subsequent bid would be advisable, by conducting a detailed analysis of the financial implications, market response, and strategic decisions that derive from the transaction.

## Keywords

Mergers & Acquisitions, Corporate Finance, Capital Structure, Strategy, Diversification, Private Equity, Share Price, Synergies, Public Information, Volatility, Stock Market, Financing, Bidding War, Innovation, Semiconductors, Lightning, Technology, Corporate Valuation,

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209)

## Table of Contents

GROUP PART	6
1. Setting the Stage: AMS' ambition	6
2. Illuminating the Industry: A Historical Perspective on Lighting and Semiconductors	7
3. AMS: Navigating the Semiconductor Terrain	9
4. Leap Forward: Everke's Era of Innovation and Growth	11
5. OSRAM: A Century of Lighting Innovation	14
6. Diversifying Brightness: OSRAM's Product Portfolio	15
7. A poor financial trajectory: OSRAM's failed transformation plan	17
8. Shining a Light on Market Dynamics: The LED Revolution	21
9. The Acquisition Game: Bidding for OSRAM	23
10. Reasoning behind the Deal	26
11. Crossroads of Decision: AMS's Strategic Dilemma in Acquiring OSRAM	29
EXHIBITS LIST	34
EXHIBITS	35
BIBLIOGRAPHY	55
INDIVIDUAL PART – GUILHERME RAMALHO	66
Case Synopsis	66
Learning Objectives	67
Target Audience	67
Teaching Plan	67
Assignment Questions	68
Analysis	68
References	79
Appendix List	82
Appendix	83

## GROUP PART

### 1. Setting the Stage: AMS' ambition

On the evening of September 3rd, 2019, a sleepless night gripped Alexander Everke, CEO of Austria Mikro Systeme International GmbH (AMS). The day marked the company's latest attempt to acquire a substantial stake in OSRAM Licht AG (OSRAM), a leading entity in the lighting industry. Everke, known for his strategic acumen, wrestled with the uncertainty of their latest move in the public markets. "Were we able to secure enough equity to succeed in the takeover bid?" he continuously asked. The initial response, indicating that only 20% had been secured, with an additional 9% committed by other shareholders, was a mix of hope and apprehension.

The unfolding of events later in the week would justify the concerns, as news painted a different picture, one fraught with challenges and strategic obstacles. The intense corporate battle for control over OSRAM was far from over, as in a surprising twist, AMS's bid fell short, missing the target stake in OSRAM by a mere 11 percentage points. This narrow miss, while not a devastating blow, left a significant gap – a window of opportunity for other potential acquirers, notably Bain Capital, now with a new strategic partner, Advent Capital, who remained a persistent and intimidating competitor in this high-stakes acquisition game, with no signs of backing down.

Everke now faced a crucial dilemma: should AMS escalate their bid in a decisive move to outmaneuver the competition, or had they already stretched to the limits of a reasonable offer? The value that OSRAM could potentially add to AMS's portfolio was undeniable, but at what cost? The stakes were high, and the consequences of further action, or inaction, were complex and far-reaching.

For AMS this was a moment of strategic importance, but it was also a test of leadership and strategic foresight for its CEO, Everke. Known for his exceptional track record and revered

status within AMS, he was aware that the decisions made in the coming days would not only shape the future of AMS but also potentially solidify his already legendary reputation within the firm.

His next steps would now require careful consideration and a clear understanding of what was at stake, focusing on understanding the market's history and dynamics, the actions of competitors, and, above all, the real value OSRAM could bring to AMS.

## **2. Illuminating the Industry: A Historical Perspective on Lighting and Semiconductors**

Light has significantly shaped the evolution of the human species, with the first use of controlled fire, in the 17th millennium BC. Millennia later, during the first Industrial Revolution, in the 18th century, several inventors recognized the potential of electric lighting, but Thomas Edison's successful commercialization of the incandescent light bulb truly transformed the world's approach to illumination. Its widespread adoption paved the way for modern lighting systems and through continuous improvement of patents, over the next centuries, innovation flourished, greatly enhancing energy efficiency, longevity, and adaptability.

At the same time, during the 19<sup>th</sup> Century, another great discovery would come to revolutionize the World: Semiconductors. Initially serving as converters for alternating current into pulsating direct current, they evolved into transistors and diodes, in the 20<sup>th</sup> century, revolutionizing electronic circuit production and giving birth to the integrated circuit (IC), today all around us, in our computers, smartphones, cars, etc. and an indispensable piece of society as we know it.

The late 19<sup>th</sup> and 20<sup>th</sup> centuries saw the lighting and semiconductor industries undergoing substantial evolution, paving the way for the rise of major companies. This period was marked by significant innovation and development, but a key similarity emerged: the industries saw

extensive consolidation among their major players, primarily driven by spinoffs, restructurings, mergers, and acquisitions.

The lighting sector presents a notable instance of this trend. In 1882, the merger of Edison General Electric and Thomson-Houston Company laid the foundation for the enduring presence of General Electric Company, a giant still present today. In 1919, Auergesellschaft, Siemens, and AEG would merge their lighting subsidiaries to establish OSRAM, a strategic move aimed at competing with Dutch rival, Philips, which had recently undergone a substantial capital infusion and modernization of their machinery. In more recent years, in 2012, Eaton, an industrial manufacturer, were to acquire Cooper Industries, a manufacturer with emphasis on lighting solutions, which was later sold, in 2020, to Signify, the company resultant of a spinoff of Philips' lighting division.

It is interesting to notice, however, that, historically, this high level of Mergers and Acquisitions (M&A) often led to the formation of cartels, at both regional and global levels, with the most prominent example being the Phoebus Cartel. As a consequence, concerns about anti-competitive practices and monopolistic behavior in the industry would be raised by regulators, prompting scrutiny and interventions, and giving origin to the first governmental standards in the lighting industry. Post the era of the Phoebus Cartel, regulators began to closely monitor M&A activities in the industry, ensuring fair competition by considering several key factors: minimal overlap in the product portfolios and market shares of merging entities, the presence of alternative products and the feasibility of new market entrants, dynamic market conditions that foster continuous product evolution, and the involvement and perspectives of various stakeholders.

In the semiconductor industry, although no remarkable case of cartels ever existed, industry players also saw their share of transformative deals. In 2000, Burr-Brown, pioneer and leader in many analog semiconductor products and techniques, was acquired by Texas Instruments for

a whopping \$7.6 billion. In 2004, Freescale was created as the result of the divestiture of Motorola's Semiconductor Products Sector, later being privatized in 2006 for \$17.6 billion and subsequently merging with NXP Semiconductors in 2015 for \$11.8 billion. More recently, in 2017, Intel acquired Mobileye for \$15.3 billion and Analog Devices purchased Linear Technology for \$14.8 billion, underscoring the ongoing consolidation trend in the market and mirroring the motivations observed in the lighting industry.

This surge in deal-making across both industries can be attributed to a combination of a multitude of common factors that started to exponentially increase in the last century. Continuous innovation has always been central in both industries for their growth, even a matter of survival: the ever-shorter product life cycles mean slower innovating companies will be left behind. In turn, this translates into Intellectual Property's skyrocketing importance, not only as a defensive mechanism, but also to providing strategic opportunities to navigate the competitive landscape and create additional revenue streams, being one of the main drivers behind M&A dealmaking. Furthermore, looking at the semiconductors industry as a benchmark, to achieve the gains Moore's Law predicted (a doubling of the number of transistors in IC's every two years) a parallel doubling in Capital investments is required to double the power of a computing chip. Companies in high-tech fields, like semiconductor and lighting industries, are, then, more likely to merge as a means of decreasing costs in future R&D expenses and/or acquire already patented products at a lower cost. M&A dealmaking in the semiconductor industry can also be driven by a desire to acquire complementary technologies, expand market share, gain access to new markets, or acquire talented personnel.

### **3. AMS: Navigating the Semiconductor Terrain**

Austria Mikro Systeme International GmbH. (AMS) was founded in 1981 as a result of a joint venture between American Microsystems Inc. (AMI), a well-established American

semiconductor manufacturer and technology company, known for producing microcontrollers, integrated circuits, and other semiconductor products and VOEST Alpine AG (VOEST), a major Austrian steel and technology conglomerate which was an important player in the global steel market. At that time, the semiconductor industry was highly competitive and there was growing demand for specialized semiconductor solutions in industries such as automotive, industrial automation, and consumer electronics. (*Exhibit 1*)

Despite having different objectives – AMI wanted to provide its clients with advanced sensor solutions in a broad range of industries, whereas VOEST wanted to diversify its core business from steel production - both players realized that Austria (with a strategic location in the center of Europe, well-established infrastructure, skilled engineers and high volumes of R&D investment from the government) was a very attractive location to create a company specialized in the development and provision of semiconductor solutions.

In 2019, the company had grown to become a worldwide leader in its three main product lines (Optical sensing, Imaging and Audio Sensing) that supplied products for two different business segments: Consumer and Automotive, Industrial and Medical (AIM).

**Optical Sensing**, in particular 3D sensing, was the most important driver of medium to long-term growth. The company supplied leading smartphone manufacturers with face recognition, authentication, and lighting sensors. In 2018, AMS unveiled a transformative technological advancement known as “behind OLED (BOLED) sensing”, that allowed manufactures to produce a new generation of smartphones with expansive screens and virtually bezel-free design. By leveraging these capabilities on the Consumer segment, the company was actively pursuing pioneering solutions in autonomous driving systems and medical health solutions that allowed individuals to monitor key personal health indicators in real time.

Within **Imaging**, the company held a leading position in advanced global sensors solutions in medical imaging and global shutter sensor technology, with important applications in digital X-Ray, mammography, and traffic control, for example.

AMS also held a strong position in **Audio Sensing** solutions, which were related to active noise cancelling technologies for consumer devices such as earbuds, earphones, and headsets, being particularly strong in the growth market for true wireless stereo earbuds.

#### **4. Leap Forward: Everke's Era of Innovation and Growth**

When Alexander Everke was appointed CEO in October 2015, a well-defined objective was set in motion: to position AMS as the preeminent global force in sensor technology across four swiftly expanding sensing markets, namely Optical, Imaging, Environmental, and Audio Sensing. In tandem with this strategic vision, the company outlined highly ambitious financial targets, encompassing a robust 30% Compounded Annual Growth Rate (CAGR) through 2019, culminating in a milestone achievement of reaching €1 billion in revenues. Simultaneously, a target of sustaining a 30% EBITDA margin from 2019 onwards was also established. Everke's own statements underscored his enthusiasm for the new leadership role and his confidence in a successful tenure: *“This is an exciting time to lead AMS. Sensors touch almost every aspect of our lives – from smartphones to wearables, Internet-of-Things (IoT) devices, industrial applications and connected vehicles – and AMS is poised for further growth with our portfolio of industry-leading sensor technologies.”* The new CEO brought 25 years of experience in the semiconductor industry with former senior executive positions at Siemens, Infineon and NXP Semiconductors with an academic background in electrical engineering and international business.

Indeed, when Everke began his mandate in March 2016, he could hardly have dreamed that the first 2 years would unfold so favorably. In 2017, the company achieved the ambitious goal of

attaining €1 billion in revenues, accelerating its realization by two years. Annual revenues grew by 93%, driven by the large adoption of 3D and light sensing by high-end manufacturers like Samsung and Huawei. As a result, the consumer segment registered a remarkable 161% annual growth of sales and accounted for 69% of total turnover. (*Exhibit 2*)

At the same time, the new leadership embarked on an aggressive M&A strategy, marked by several acquisitions over the two-year period that significantly contributed to these developments. (*Exhibit 3*) First, the acquisition of Heptagon, in October 2016, for over €524 million, a globally renowned leader in high-performance optical packaging and micro-optics, positioned AMS as the undisputed global leader in end-to-end optical solutions, in Everke's words: "*Combining AMS and Heptagon creates the clear #1 in optical sensing technologies and fast-tracks our innovation capabilities. As a result, we expect AMS to drive the optical sensing agenda in the years to come and broaden its market reach.*" Second, in March 2017, the acquisition of Princeton Optronics, Inc., a prominent provider of high-performance Vertical Cavity Surface-Emitting Lasers (VCSELs), unlocked substantial growth opportunities in smartphone and automotive 3D sensing, for which VCSEL confer considerable competitive advantages. As stated by AMS CEO, "*Princeton Optronics is an integral strategic partner for AMS/Heptagon in the realm of optical sensing products, and we anticipate numerous potential synergies arising from this exciting amalgamation*".

Apple's CEO, Tim Cook, ignited a wave of excitement as he unveiled the iPhone X, hailed as "*the product that will set the path for the next decade,*" marking a profound milestone, in September 2017, a decade after Steve Jobs introduced the first iPhone. Behind the impressive 5.8-inch all-screen OLED display and the groundbreaking 3D Facial Recognition technology lay the brilliance of AMS's technology, being the device that reimagined the smartphone landscape and pushed the boundaries of technological innovation.

The product launch was a tremendous success, with consumers clamoring for the iPhone X, leading Apple to anticipate its most profitable quarter in corporate history, a wave of success that AMS also rode. *(Exhibit 2 and Exhibit 4)* After emerging as one of the top-performing stocks in European equity markets that year (204% growth year-over-year (YoY)), AMS revised and elevated its growth projections in early 2018, setting an ambitious target of 60% CAGR on revenues until 2019, i.e., €2.2 billion, and a 30% EBIT margin starting from that year, which would surpass industry peers significantly. *(Exhibit 5)*

2018 was marked by a period of notable expansion, although it also presented its fair share of challenges. Unforeseen and rapid fluctuations in consumer demand, particularly, impacted the consumer business segment. For the first time, the smartphone industry experienced an unprecedented contraction characterized by a significant decline in demand, as global smartphone shipments contracted 4% YoY. *(Exhibit 6)* This decline in smartphone demand was primarily attributed to lengthening replacement cycles, particularly evident in developed markets, the absence of groundbreaking innovations and higher price points. For example, the new iPhone started at \$999 versus \$649 for the iPhone 7. As a result, during the early stages of the second half of 2018, Apple initiated discussions with its suppliers, urging them to reduce the production of iPhone components destined for the market's year-end offerings by as much as 20%. This development sent ripples across Apple's supply chain, particularly impacting several key suppliers like Qorvo, Lumentum or TSMC which reported earnings and revenue guidance below initial expectations for the year.

As anticipated, AMS was notably impacted by this situation, with the share price declining 74% YoY and a revenue growth of 34%, clearly below the consensus estimate by Analysts. Also, the increase of the Net Debt/EBITDA ratio from 1.65x in 2016 to 3.71x at the end this year was a major concern for investors. *(Exhibit 2)*

Xiaomi was the fastest growing smartphone producer, selling a record 119 million units in 2018, despite the industry decline. In July, AMS made a significant announcement, revealing its role in powering the first-ever Android smartphone with a facial recognition solution for Xiaomi's Mi8 model, which was an extension of their partnership established in 2014 when Xiaomi began incorporating AMS's sensor solutions in various smartphone models.

In the first half of 2019, AMS capitalized on the booming demand for OLED-equipped bezel-less smartphones among Android manufacturers and the production of the Mi8 smartphone, recording a strong financial performance, with operational profitability improvements.

*(Exhibit 2)*

For the remaining part of the year, the management board maintained a positive outlook, with the anticipation of achieving annual revenues exceeding \$2 billion - “*we see a more stabilized consumer demand and smartphone demand*”, the CEO stated - along with an EBIT Margin of 25%, very close to the long-term financial targets to be achieved by 2020. Additionally, they aimed to significantly reduce the net debt to reach a target level of Net Debt/EBITDA of 2x.

*(Exhibit 2)*

## **5. OSRAM: A Century of Lighting Innovation**

OSRAM Licht AG's story began in 1906 when it was established in Berlin, as a trademark for the incandescent lamp developed by Carl Auer von Welsbach. Following the merger of the lighting business of Auergesellschaft, Siemens & Halske and AEG, OSRAM as a company was established in 1919, with its name being derived from "osmium" and "wolfram" (the German word for tungsten), two elements used in early lamp filaments.

The company developed both a vertical and horizontal structure by acquiring and establishing facilities capable of efficiently producing every component required for lamp manufacturing, while expanding them abroad.

It's more than a century of existence was marked by a series of industry leading developments alongside some hard times, especially during the World War II when it was forced to produce equipment for military applications, navigating through shortages in raw materials and qualified labor. The first post-war lamp was produced in 1945, taking OSRAM just four years to deliver more than a million other fluorescent lamps. The aftermath of the war became remembered by the famous slogan "*OSRAM – hell wie der lichte Tag*" ("*OSRAM as bright as day*") becoming a symbol of Germany's peacetime.

Until the late 1980s, the company had established a European and South American footprint, through a network of sales offices and founded subsidiaries, but it was only in 1993 that OSRAM entered the American market, through the acquisition of Sylvania North American Lightning. This move pushed OSRAM's World market share from 14% to 20% overnight while also increasing their annual revenues by 70%, something deemed unachievable for any organization at the time.

During the following years, the company ended up going through a period of fast innovation, developing technologies such as the halogen lamp used in automotive headlights and film projection, as well as the light-emitting diodes (LEDs) which were widely used both in commercial and industrial settings due to higher energy efficiency. By the early 2000s, OSRAM had emerged as the globe's second-largest manufacturer of LEDs and was launching their new chip offering as the market for technologies like opto-semiconductors was taking off.

## **6. Diversifying Brightness: OSRAM's Product Portfolio**

After restructuring with the intention to strengthen the strategic focus on "*digitalization and markets of the future*", OSRAM was positioning itself closer to a "*high-tech photonics company*" rather than just a lightning manufacturer, by concatenating their segment structure in 2019 and dividing each business unit by application: opto-semiconductors (OS), automotive applications (AM) and digital applications (DI).

**Opto-semiconductors** are devices that combine elements of both optics (light) and electronics (semiconductors) to control or manipulate light for various applications. OS offers an extensive portfolio of LEDs across various power categories with the product range extending to infrared, laser, and optical sensors. These products find their applications in fiber optic communication systems, regular displays and lighting, photodetectors, and medical devices. OS alongside the Japanese Nichia were still the front runners in the highly competitive opto-semiconductors market, where the key competitors arise mainly from Asia (strongest market for this business unit) featuring companies like Samsung and LG Innotek.

On the **Automotive** business, OSRAM developed and manufactured a variety of lightning solutions through lamps/modules and sensors to be sold in partnership to Original Equipment Manufacturers (OEMs) and their suppliers, as well as players in the after-market automotive environment. The offer ranged from headlights, taillights, fog lights and interior lighting, to the more advanced LED and laser systems, which provided energy-efficient and high-performance lighting solutions. This innovation path led to the more recent adaptive lighting systems and sensors, which improved driver safety and comfort by being able to adjust the beam pattern and intensity based on driving conditions.

The automotive sector was characterized by a stringent regulatory environment and an intensely competitive market landscape which compelled OSRAM to focus on the energy efficiency, durability, and safety of its products. This focus was complemented by a commitment to eco-friendly lighting solutions, aligning with the increasingly prominent trend towards sustainability. Key competitors in the industry include established firms such as General Electric and Lumileds, along with NICHIA, a prominent Japanese company that poses considerable competition to OSRAM. (*Exhibit 7*)

Lastly, the **Digital** business unit was established in the fiscal year 2018, designed to consolidate all the company's operations that were optimally situated to leverage the rapidly growing

importance of digital technologies and intelligent lighting solutions. Digital comprised the products and solutions from the former independent Specialty Lighting and Digital Systems business units, whose consolidation brought together a diverse range of offerings, including stage, cinema, and studio lighting systems, LED-based plant cultivation systems, and lighting solutions tailored for medical and industrial uses. Additionally, it encompassed innovative products like LED modules and light management systems, integrating these lighting solutions into the Internet-of-Things (IoT) ecosystem.

These solutions leveraged digital technologies to enhance lighting control, boost energy efficiency, and improve the overall user experience. In the digital domain, its main competitors were Asian companies such as LG, Inventronics, and Delta Electronics. Notably, DI distinguished itself from the remaining business units given that a significant portion of its revenue was generated from the Americas, particularly North America.

## **7. A poor financial trajectory: OSRAM's failed transformation plan**

In the autumn of 2014, OSRAM found itself at a pivotal crossroads. The company, grappling with the relentless shift in market preferences towards more energy-efficient lighting solutions, announced the appointment of Olaf Berlien as its new CEO/CTO on November 5th. Berlien, a former board member of major European industrials, was considered as a strategic mastermind, able to navigate the complexities of rapidly evolving technological markets. This optimism was not only shared by the supervisory board but resonated through the market as OSRAM's shares experienced a 3.4% surge, a ripple of confidence boosted by quarterly results that surpassed expectations.

The journey ahead for OSRAM, under Berlien's leadership, was nothing short of arduous. The company was at a crucial juncture, facing the inevitable decline of traditional lighting markets. Consumers, driven by an appetite for sustainability, were rapidly transitioning to LED and

halogen solutions. This shift was intensified by the emergence of low-cost, chip-based technologies from competitors like Samsung Electronics and Toyoda Gosei, further challenging OSRAM's traditional stronghold.

In response to these market forces, OSRAM embarked on a significant restructuring journey, one that was both painful and necessary. By mid-2014, this path led to substantial cost savings and a considerable reduction in the workforce, trimming the company's size by nearly 17,000 employees. But the most transformative change was still on the horizon.

A few months into his tenure, Berlien steered OSRAM towards a momentous decision: the divestment of its general lighting lamps business. This bold move, culminating in the €500 million sale of this division as LEDVANCE in 2017, was a clear signal of the company shedding its old skin to embrace modernization. The numbers painted a stark picture of this transition: sales of traditional lamps had plummeted by nearly 10% YoY. In stark contrast, the segments of LED-based lamps/systems and Opto-semiconductors were thriving, boasting increases of 70% and 9%, respectively.

As highlighted by the board: "The lamps market is a volume market in which consistently high quality and cost efficiency are crucial competitive factors. It differs fundamentally from the technology markets, which are characterized by innovation, tailor-made solutions, and sustainable growth. OSRAM intends to focus on these technology markets in the future through its businesses with opto-semiconductors, automotive and specialty lighting as well as luminaires, lighting systems and solutions."

The stage would be set for OSRAM to change what had been 100 years of a straightforward sales approach into a new business model, in what would be the most profound change seen in the company since its origin. Under the visionary leadership of Berlien, the company presented the ambitious "Diamond" initiative, a strategic pivot aimed at transforming OSRAM into a cutting-edge photonics powerhouse. This journey would be marked by a daring investment of

€1 billion to construct a state-of-the-art LED chip plant in Malaysia and an additional €2 billion funneled into R&D. By 2020, this strategic overhaul was projected to rocket the company's revenue and EBITDA CAGR to 8% and 9%, respectively, and quintuple its LED chip production capacity.

However, the market's reception to this move was less than welcoming. Upon the announcement, OSRAM's shares took a steep 25% dive, reflecting investor apprehension over the perceived high costs and risks associated with this strategic redirection. In their perspective, the pivot steered OSRAM towards the highly competitive and commoditized general lighting market, dominated by Asian players, moving away from its profitable niches in the automotive and specialty lighting sectors. This shift, especially after shedding its waning Lamps unit, was a gamble, raising eyebrows among key stakeholders. (*Exhibit 9*)

Siemens, the company's largest shareholder owning 18%, voiced significant concerns. Despite numerous dialogues with OSRAM's management, the Siemens CEO remained skeptical, cautioning that this strategic shift could markedly increase OSRAM's risk profile.

Ironically, this period of strategic upheaval and market skepticism coincided with a robust demand for OSRAM's automotive and semiconductor products. In 2016 and 2017, these segments witnessed revenue surges of 6% and 9%, respectively. Profit margins remained steady, and remarkably, the company's valuation doubled from its late 2015 levels, despite an overall small positive currency-related impact. By the end of 2017, OSRAM's stock reached an unprecedented peak, soaring to €77 a share in December – a staggering 100% increase from its bottom in 2015/2016. Despite the initial backlash and market trepidation, OSRAM's resilience and performance told a story of a company undeterred, forging ahead on its path of transformation and innovation. (*Exhibit 9 and 10*)

Nonetheless, despite the company's promising trajectory, Siemens, its largest shareholder, harbored deep-seated reservations. Siemens viewed OSRAM's new strategy as a double-edged

sword, potentially delaying the company's results and jeopardizing its performance. In a strategic move, Siemens decided to capitalize on OSRAM's robust performance at the time, divesting its 18% stake in October 2017. This sale, amounting to a substantial €1.2 billion to institutional investors, marked the end of a longstanding alliance with the lighting titan, driven by differing visions for the future of the general LED lighting market. Little did they know the timing of this divestiture would be perfect, as the ensuing months would unveil a dramatic shift in OSRAM's fortunes.

As the calendar turned to 2018, the Chief Financial Officer, in a tone of cautious realism, briefed analysts and investors during a conference call. He set the stage for what was anticipated to be a year of stagnation, acknowledging, *“We affirmed our guidance for the year, but we have to say that it is a forecast that is certainly ambitious and is probably at the bottom of end of the guidance range”*. This acknowledgment was not just a casual remark but a harbinger of the challenges that lie ahead.

The year was marked by a confluence of adverse factors, creating a perfect storm for OSRAM. The company's aggressive investments in Asia, aiming to capture new markets, were met with escalating R&D costs. Simultaneously, currency fluctuations, particularly the strengthening of the Euro against the US Dollar, gnawed at the company's financial stability, given its heavy reliance on the Dollar for a substantial half of its revenues. The automotive exports market, once a robust pillar of strength, began to falter, further intensifying the strain.

In just six months, these factors culminated in a sharp decline of OSRAM's shares by a staggering 50%, mirroring the company's "muted business" activities. Behind the scenes, OSRAM was grappling with a dual-front battle: engaging in tough negotiations over cost-cutting measures with the German workforce, while simultaneously striving to fuel its expensive Asian expansion, amidst a backdrop of continuously downgraded profit and growth projections for the year. (*Exhibit 9*)

Analysts from Jefferies shone a light on the internal challenges, noting, “Slowing production rates and the rapid decline of legacy technologies such as Xenon are taking their toll and H2 car production will be weaker than OSRAM expected, particularly in Asia”.

However, the real litmus test for OSRAM's strategy came with the arrival of 2019. The first quarter results painted a bleak picture, underscoring the struggles across all business units. The press release from the company was forthright in its admission: *“The weak operating performance is reflected in all three business units. For example, the Opto-Semiconductors unit recorded a 16.9 percent decline in revenue on a comparable basis in the first quarter. The reason for the disappointing revenue development is the accelerated market decline, especially in December 2018. Particularly affected were the core markets Automotive, General Lighting and Mobile Devices. Foremost, the ongoing trade conflicts, the weak growth in China and the general political uncertainties had a negative impact. As a result, visibility for the quarters ahead will remain significantly low”*.

This tumultuous period saw OSRAM's stock price take a dramatic plunge, halving from a robust €75.00 in January 2018 to a mere €35.00 a year later. This steep decline not only reflected the company's financial struggles but also marked a pivotal moment in its storied history, as it grappled with the realities of a rapidly evolving global market.

## **8. Shining a Light on Market Dynamics: The LED Revolution**

As reported by Fortune Business Inside in 2019, the global lighting market reached a valuation of US\$ 118.33 billion in 2019, and was forecasted to expand to USD 163.72 billion by 2027, at a CAGR of 4,3%. A significant segment of this market, General Lighting — encompassing products like bulbs, tubes, modules, and luminaires — constituted 79% of the total market share, in 2019. A notable sub-sector within this market is traditional illumination, which maintained a stable market size of €5 billion and was anticipated to experience modest growth

rates of 4% up to 2023. This trend was largely driven by a shifting preference towards LED lighting, which was expected to surge from US\$ 69.7 billion to US\$ 98.5 billion by 2023. This expansion was projected to involve an increase in units sold, from the 2019 record number of 10 billion units to 14 billion units by 2022, representing a CAGR of 13.66%.

Several factors underlined this anticipated growth in the LED segment. Key among them was the ongoing global reduction in LED prices, coupled with rising living standards, particularly in densely populated countries like India and China. Government policies, driven by resource scarcity and climate change considerations, were also increasingly promoting LED adoption, a trend was particularly pronounced in the European Union, which had already enacted measures to phase out less efficient lighting technologies in favor of LEDs. Consequently, the European Lighting Market was projected to become the second-largest LED market globally by 2024, reaching a market size of USD 30 billion. This growth marks an increase from €16.3 billion in 2012 to €19.8 billion in 2020, positioning it just behind the United States — the largest importer and consumer of LED lighting. The U.S. market was anticipated to exceed USD 30 billion by 2022, with the value of imports growing by 6.5% compared to 2017. Meanwhile, China had already emerged as the world's leading exporter and manufacturer in this sector, significantly influencing global prices, in part due to government subsidies and incentives.

The lighting industry features a complex structure with diverse players, including hardware manufacturers, designers, and Original Equipment Manufacturers (OEMs). Among these, several Asian companies such as MLS Lighting, Nichia, and Everlight dominated in the manufacturing of Packaged Lights, with eight companies in the top 10, out of which 4 were Chinese. Europe is also a key player, represented by Lumileds and OSRAM as the 3rd and 4th largest producers, respectively. (*Exhibit 27*). Collectively, these top 10 companies command a substantial 48% of the global market share, indicative of a significant degree of market concentration.

## 9. The Acquisition Game: Bidding for OSRAM

After a poor achievement during the transformation process, OSRAM's precarious financial performance in the markets would not go unnoticed, swiftly drawing the attention of acquisition-hungry suitors, which at the time were closely monitoring the situation, and considering the strategic benefits of acquiring the beleaguered giant. Out of these, in February, Bain Capital, joined by the Carlyle Group, were the first to step into the spotlight, exploring a joint takeover bid of the venerable industry titan, in early 2019. *(Exhibit 11)*

In response to these circulating rumors, OSRAM's shares would go on to a robust rally, surging by 15% and, briefly, reaching €40.00 in the subsequent week. A short-lived resurgence, however, as the company's unsatisfactory performance persisted into the second quarter of 2019, reaching a negative EBIT margin of -4.54%, leading to a sharp decline in the stock price, hitting a record low of €25.00/share in June 2019, and valuing the company at €2.42 billion. *(Exhibit 9 and 13)*

*After an extensive due diligence and an intensive negotiation process between both Private Equity investors and OSRAM, that did not find any regulatory constraints, Bain Capital and Carlyle took advantage of the news-related price swing, making the first voluntary public takeover offer: a “premium of 27.7 percent over the volume-weighted average stock exchange price in the last month prior to 3 July 2019”, meaning a cash offer of €35.00 per share and a total valuation of €3.4 billion, in July, 3<sup>rd</sup>. (Exhibits 11, 12 and 13) On top of that, the investment agreement also included “(...) certain commitments by Bain Capital and Carlyle with regard to operations, material assets and employees of the Company, including existing works and collective bargaining agreements. The Investors intend to continue the constructive dialogue with OSRAM's employees which forms an integral part of the Company's culture.”. The investors were looking forward to a swift conclusion of the transaction, which is a typical requirement in a high-tech sector deal, where the pace of innovation and market dynamics are*

*particularly rapid. Such urgency is driven by the need to capitalize on emerging technological opportunities and to minimize the financial and operational uncertainties that can accompany prolonged negotiations.*

Around the same time, an unexpected player was to express their interest: AMS. The Austrian-based sensor manufacturer saw substantial potential in acquiring and integrating OSRAM into its operations, but significant challenges due to the disparity in size - AMS was around 3 times smaller than OSRAM - and the hurdles associated with securing the necessary financing were proving to be an obstacle in AMS's way. Without AMS formally bidding for OSRAM, securing takeover financing, or starting due diligence procedures, however, the management of OSRAM's management conveyed their support for the takeover proposal from Bain and Carlyle, acknowledging the advantages that such a deal could bring. OSRAM's CEO, Olaf Berlien, expressed this sentiment, stating: *"Bain and Carlyle are the right partners for OSRAM at the right time. They support our strategy and facilitate growth. Both are committed to our employees and offer shareholders an attractive premium."* (**Exhibit 11**)

Upon observing that Bain and Carlyle's takeover bid appeared to be favorably progressing towards acceptance, AMS reassessed its position regarding the potential transaction, issuing a statement indicating the change in their stance, *"(...) following an evaluation of recent developments AMS does not see a sufficient basis for continuing these discussions with OSRAM Licht AG"*.

A surprise was yet to strike, however, as, despite the management's endorsement, Carlyle's bid would not go on without facing considerable opposition from the major shareholders: Allianz Global Investments, holding a significant 9.3% of the total equity, and SdK Group, the latter representing the interests of over 440,000 individual investors and around 25% of OSRAM's equity, at the time. Both voiced strong dissents, underscoring their belief in OSRAM's future potential and technological prowess, firmly stating that, after all, *"there is upside potential for*

*OSRAM and its technology in the foreseeable future*” and they would not be tendering any shares as they found them “*worth more than €35 per share currently on offer.*”. Allianz Global Investments expressed a strong disappointment with OSRAM’s Executive and Supervisory Boards: “*AllianzGI finds it regrettable that they appear to have insufficient confidence in the business they are managing that they have chosen instead to sell out at what looks to be a knock-down price*”. With the votes of more than 34% of OSRAM’s Equity against the takeover, it would prove impossible for Carlyle and Bain Capital’s bid to move forward.

Following the significant backlash on the consortium’s bid, AMS changed its stance, and “...decided to re-evaluate a potential transaction with OSRAM Licht AG. [...] AMS was recently approached by potential financial partners and has exchanged views which confirm its belief that AMS can arrange prudent and committed financing for this potential transaction”. For the first time, Everke and his team were showing preparedness to make the deal and, on the 12<sup>th</sup> of August, the Austrian company was offering €38.50 per share in a cash offer, representing, a 33% premium to the day prior to the first offer, a 10% premium to Bain and Carlyle’s offer. Furthermore, the deal already had fully committed financing: a €4.2 billion bridge facility, underwritten by HSBC and UBS, that would ensure immediate financial support for the transaction, with full permanent financing planned to be established after regulatory clearance, in the form of a €1.5 billion equity issuance and a €2.7 billion debt issuance, with “expected credit rating in the BB area.”. AMS had also retained a significant portion of its Cash Flows during the previous year, as Excess Cash, which it was proposing to be used in the amount of €0.3 billion to finance part of the transaction.

These would allow AMS to acquire 62.50% of OSRAM’s equity, in junction with debt refinancing and transaction costs, which included legal fees, accounting fees, investment banking fees, due diligence costs, and other miscellaneous expenses. (*Exhibit 14*)

As a result, the leadership at OSRAM started to see the potential benefits of AMS's offer with both the managing and supervising boards at OSRAM showing their support for the bid, marking a major milestone for AMS. Nonetheless, OSRAM's CEO remained unconvinced, and stated that he would not tender any of his 31,750 shares in the case of AMS's bid.

Berlien's reservations stemmed from a clause in AMS's offer, which had no intentions in the continuation of OSRAM's IoT lighting segment, but rather focus on the synergies that could arise from the Photonics and Sensors departments, which Berlien stated to be doubtful about. In essence, it was a fundamental difference in perspective: he prioritized the long-term stability and resilience of OSRAM's existing business strategy, a strategy that he believed comprehensively catered to the interests of all stakeholders involved, while AMS believed that the two companies together could create a "*global leader in sensor solutions and photonics*".

At the same time, unions and employee representatives, who, at the time, made up half of OSRAM's advisory board, were not convinced by the proposition made by AMS and voiced their concerns. They were unsure about AMS's planned savings from the deal, saying they would lead to job losses and facility closures in Germany, and believed that the PE funds were making better guarantees towards them.

## **10. Reasoning behind the Deal**

Despite the challenges posed by its dependency on Apple, Alexander Everke, AMS's CEO, consistently conveyed optimism and confidence in the company's future. Throughout 2018, he announced new business opportunities with Android OEMs, demonstrating a proactive approach to diversifying the company's customer base. This strategic move aimed to mitigate the risks associated with overreliance on a single customer, a concern that undoubtedly weighed on Everke's mind.

While AMS has maintained a certain level of secrecy regarding the identity of its primary customer, industry analysts have approximated that the semiconductor manufacturer derives a substantial portion, estimated at, approximately, 40 to 45% of its total revenues from Apple. This significant reliance on one major client had a pronounced impact on AMS as evidenced by its less favorable performance in 2018. (*Exhibit 4*) The reduced demand for the iPhone X, which was eventually discontinued in September and replaced by the iPhone XS and the more affordable XR models, raised concerns among investors about the Austrian company's outlook. Therefore, acquiring OSRAM would significantly change AMS's current situation. It would mean a structurally improved revenue mix and an enhancement of business profile for AMS. As shown in *Exhibit 16*, adding OSRAM's automotive segment would balance AMS's income, making it the largest source of revenue ahead of the consumer segment in the near term, with both segments poised to contribute equally to the company's income in longer-term projections. This transition embodies a deliberate acceleration in diversifying revenue streams, allowing for a considerable scale-up in automotive products. Additionally, it would lead to a reduction in the customer concentration on the Consumer segment, mitigating risks associated with the dependency on Apple. Hence, this segment's growth would be fueled by delivering upon Android.

From a market coverage perspective, the acquisition would significantly enhance AMS market coverage and customer base (*Exhibit 17*). The merger would allow the combined entity to leverage AMS's strong ties with leading mobile, consumer electronics, and medical imaging manufacturers, along with OSRAM's established relationships with automotive and industrial sector clients. This strategic alliance was expected to facilitate a seamless and complementary go-to-market strategy, maximizing cross-selling opportunities, and creating a more comprehensive product and service portfolio. As a result, AMS-OSRAM would be best positioned to serve a combined customer base in all markets.

According to AMS, the merger was expected to generate at least €300 million in annual run-rate pre-tax synergies, expected to be fully achieved 3 years post-acquisition, while one-off integration costs were estimated to amount to €400 million. The €300 million, included both revenue (€60 million) and cost (€240 million) synergies (*Exhibit 18*), the latter mostly resulting from an enhanced manufacturing footprint and LED production consolidation in Regensburg (front-end) and Asia (back-end). (*Exhibit 19*)

AMS's vision was to create the global leader in sensor solutions and photonics, aiming to accelerate the standalone "*photonics champion*" strategy, being pursued by OSRAM and win in new breakthrough optical solutions by leveraging the acquired OSRAM's competitive advantages in Automotive. The strategy involved investing and growing the Opto-semiconductors and Automotive business segments, while divesting the Digital business. *Exhibit 20 and 21* provide OSRAM's board targeted financial performance per business segment presented in November 2018, when the strategy was reviewed and that served as a reference for AMS proposal.

On the opposite side, Bain Capital and Carlyle's position as private equity funds means they would not realize the synergies that AMS expected to gain from acquiring OSRAM, given the lack of an operational platform to extract the kind of strategic value that a merger between two complementary industrial players can achieve.

Nevertheless, both investment firms brought to the table more than 30 years of extensive experience helping management teams driving value to their portfolio companies. They have helped players accelerating growth and strengthening market positions in the industrial technology, semi-conductors, and automotive sectors, such as Sensata, NXP, Toshiba Memory, AZ Electronic Materials, Freescale Semiconductor, Axalta and Allison Transmission. As Dr. Michael Siefke, a Managing Director at Bain Capital Private Equity, said: "*The Company will*

*benefit from our combined global network, deep industry knowledge and the comprehensive support we will bring to bear.”*

The consortium, in contrast to AMS, had no intention of changing the company’s current strategy but was aligned with the Management’s vision, aiming to fast-track the ongoing Strategic Plan focused on Digital and IoT, in particular. This would be in line with a growing tendency of private equity funds entering the lighting business, as is example, New York-based, American Industrial Partners, which, in early 2019, acquired Current, a solid-state lighting player for the commercial sector, with the goal of fostering the company’s push into smart lighting and IoT technologies.

The investment firms also believed that taking the company private was essential to accelerate it, without any short-term looking pressures from the public markets. *“Bain Capital and Carlyle believe in the long-term potential of OSRAM. We are prepared to support the Company over the long period of time it will take to master the comprehensive challenges it is facing. At this critical juncture in OSRAM’s strategic development, we are uniquely positioned as the right partners to assure a sustainably successful future for the Company and its stakeholders. Private ownership by Bain Capital and Carlyle will give OSRAM and its management the opportunity to focus on its transformation and strategy execution without distraction and ongoing pressures from the equity capital markets.”* as Gregor Boehm, a Managing Director at The Carlyle Group has put it.

## **11. Crossroads of Decision: AMS's Strategic Dilemma in Acquiring OSRAM**

In a gripping turn of events, the Carlyle Group was to drop Bain Capital in the run for OSRAM: the group now found the risk of the deal to be too high. This would force the creation of a new consortium, between Bain and Advent Capital, which had taken ownership in a plenitude of other IoT-focused companies in the past and expressed their readiness to formulate a fresh

takeover bid for all outstanding shares, with the intention of conducting a thorough confirmatory due diligence in the ensuing weeks. The new consortium was pressed to be more fitting for OSRAM's strategic moves than AMS, as it was set on readapting, but maintaining the initial IoT-focused plan, and had previous extensive experience in venturing in similar industries.

In a calculated move, in September 25<sup>th</sup>, communicated through a letter to OSRAM's Managing Board (*Exhibit 11 and 22*), the new consortium hinted at a potential "meaningful" premium, strategically positioned to outshine the existing offer of €38.50 per share laid out by AMS. This intimation, while lacking a formal offer, cast a shadow of uncertainty over AMS's next steps.

As a result of this move and despite backlash from both the unions, workers' representants and the CEO itself, AMS did not stop itself from starting to acquire OSRAM' stock on the public markets, and during the weeks that followed the first offer, the Austrian chipmaker had spent more than €600 million to buy OSRAM shares over, becoming the largest single shareholder in OSRAM, with a 19.99% direct equity stake, surpassing Allianz GI. Any attempt by other investors to acquire OSRAM would now likely necessitate AMS's involvement in the transaction and market sentiment suggested that convincing AMS to relinquish its stake would be challenging for the private equity consortium, even with a significantly higher offer, due to AMS's strategic interest. OSRAM' publicly traded stock saw an unexpected free-float adjustment from the previous 97,11% to 77,12% as a result. (*Exhibit 9 and 13*)

This increase in the stance to approach OSRAM would culminate in the subsequent increase of AMS' previous public takeover offer, which was still in place, on September 27<sup>th</sup> to what was now a bid of €41.00 per share in a cash offer, in what they told to be the "Best and Final" offer for OSRAM. (*Exhibits 11, 12 and 13*) The German company was now being valued at €3.96

billion, and AMS was focused on outbidding all private equity funds and ensure a victory was bound to happen.

Nonetheless, and against all expectations, OSRAM's shareholders decided to tender only 51.6% of the shares to AMS, with the latter not reaching the envisaged 62.5% minimum threshold for the takeover to be a success. This narrow miss, while not a devastating blow, now left a window of opportunity for the other potential acquirers, who remained persistent and preparing a new offer set to outbid AMS' efforts.

The challenge for AMS's CEO, Alexander Everke, and the Managing Board was clear yet complex: to consider an increase in their bid to counteract the financial investors' potential move, even after their "Best and Final" offer. A regulatory cooling-off period after such an offer could be easily circumvented with a new subsidiary, but the dilemma now extended beyond mere competitive bidding; it struck at the heart of the deal's financial framework. The original financing arrangement, predicated on the €38.50 bid per share, now demanded a careful revaluation. (*Exhibits 14 and 15*) OSRAM's deal was already a high-stakes play, with a high leverage factor that added considerable risk to the company's financial health. Any decision to issue new equity had wide-reaching implications for existing shareholders and required the board's careful consideration. Moreover, the potential integration of two disparate corporate cultures and different scales posed a coupling challenge to the board, which, despite thorough due diligence, still had a considerable risk of cultural discord and managerial difficulties. Complicating matters further, AMS faced continued skepticism from the unions and workers, who were still siding with the PE funds, and expressing concerns about job security against the backdrop of a workforce numbering 26,000. These continued calling Bain and Advent to stop playing "*capital market poker*" and substantiate their offer, to deter a buyout by any other bidder. As a response, AMS had already taken steps to address these apprehensions, promising to safeguard jobs, pledging more job creation than cuts, expanding the Regensburg

manufacturing site, and maintaining a commitment to R&D in Germany, but, despite these assurances, the workforce remained unconvinced, leaving Everke with the critical task of winning their trust.

Everke's leadership was now tested as he sought a strategy that would convincingly align the employees' interests with the company's bid, ensuring a united front as AMS ventured into this corporate battle. Furthermore, with the future of AMS depending on the outcome of OSRAM's bid, the managing board now had to deliberate the wisdom of escalating their offer. The board also had to make the difficult decision on whether they were in a sufficiently good financial position to continue bidding for OSRAM, i.e., the increased leverage and the issuance of a non-insignificant level of new shares would not impact the long-term growth prospects of the AMS, and the current shareholders in the company, and, above all, if the paid-in value would still allow for a significant return to AMS.

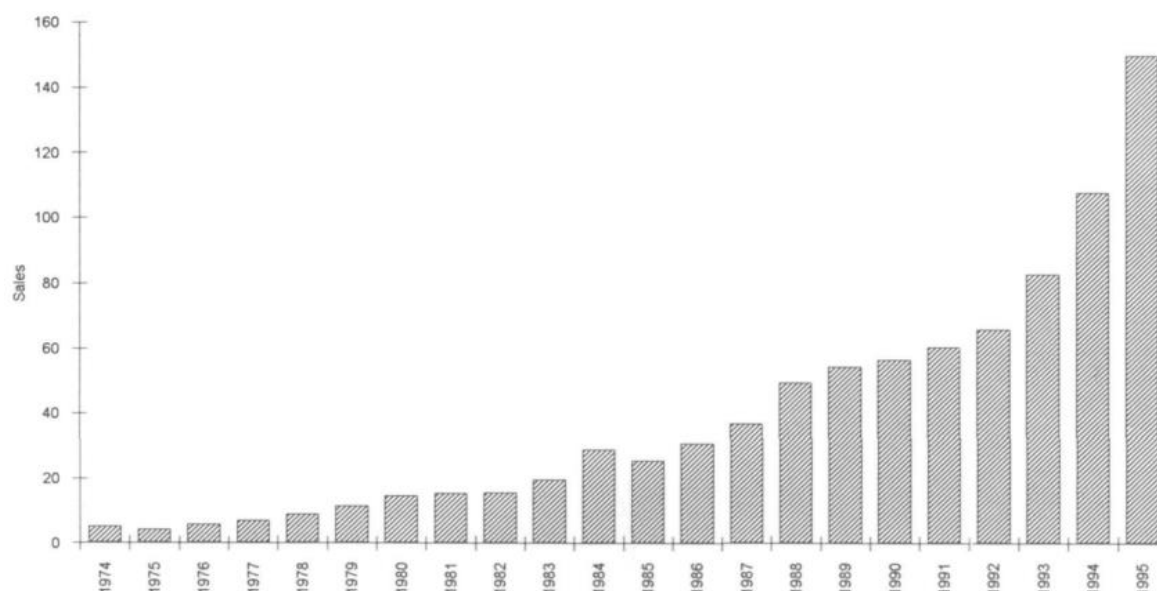
Although being well-versed in the high-stakes game of corporate acquisitions, Everke understands that the path forward is fraught with risk and opportunity alike. As he pondered the next move, he looked back, remembering his past successes to try to navigate through what was shaping up to be his most significant corporate challenge to date.



## EXHIBITS LIST

Exhibit 1: The World Semiconductor Industry between 1974 and 1995 (in bn of \$) .....	35
Exhibit 2: AMS's Recent Financial Performance (in million of EUR) .....	35
Exhibit 3: AMS M&A Activity .....	36
Exhibit 4: AMS Share Price Performance .....	39
Exhibit 5: AMS's selected peer group Recent Financial Performance (in million of CHF) ....	39
Exhibit 6: Worldwide Smartphones' Shipment Evolution.....	40
Exhibit 7: Automotive Lighting and Lighting Industries Selected Players.....	41
Exhibit 8: OSRAM's Revenue Distribution by customer location.....	42
Exhibit 9: OSRAM's Share Price Performance.....	42
Exhibit 10: OSRAM's Recent Financial Performance (in million of EUR) .....	43
Exhibit 11: OSRAM Acquisition Timeline .....	41
Exhibit 12: Summary of AMS and Bain Capital proposals for OSRAM's acquisition.....	43
Exhibit 13: AMS and OSRAM Share Price Evolution during the acquisition process between, June/2019-October/2019 .....	44
Exhibit 14: AMS proposed financing structure for the OSRAM acquisition .....	45
Exhibit 15: AMS-OSRAM Pro-forma combined leverage and Transaction Value details for the €38.50/share offer price.....	46
Exhibit 16: AMS expected revenue mix after the acquisition.....	47
Exhibit 17 : AMS and OSRAM individual go-to-market access .....	47
Exhibit 18: Expected annual run-rate of pre-tax synergies (in million of EUR).....	50
Exhibit 19: AMS and OSRAM Opto Semiconductors manufacturing footprint .....	50
Exhibit 20: OSRAM Financial Projections (in million of EUR) .....	50
Exhibit 21: OSRAM Target Financial Performance .....	52
Exhibit 22: Recent M&A deals within the Lasers and Lighting Industries (million of EUR). 51	51
Exhibit 23: Bain Capital and Advent Letter to OSRAM's Board of Directors .....	51
Exhibit 24: Average Debt Betas by Rating and Maturity .....	52
Exhibit 25: Cost of Capital Assumptions for AMS and OSRAM .....	53
Exhibit 26: Implied Credit Rating for large non-financial manufacturing firms .....	53
Exhibit 27: Ranking of the top 10 packaged LED manufacturers .....	54

## EXHIBITS

**Exhibit 1: The World Semiconductor Industry between 1974 and 1995 (in bn of \$)**

Source: EIB

**Exhibit 2: AMS's Recent Financial Performance (in millions of EUR)**

	Fiscal Year Ending September 30				Nine months Ending
	2015	2016	2017	2018	September 30, 2019
<b>Total Revenues: <sup>(1)</sup></b>	<b>623</b>	<b>550</b>	<b>1 064</b>	<b>1 426</b>	<b>1 293</b>
<i>growth rate YoY</i>	<i>n.a.</i>	<i>-12%</i>	<i>93%</i>	<i>34%</i>	
Consumer	408	279	730	1 008	
Automotive, Industrial and Medical (AIM)	215	270	334	418	
<b>EBITDA <sup>(1)</sup></b>	<b>195</b>	<b>156</b>	<b>224</b>	<b>322</b>	<b>354</b>
<i>EBITDA Margin</i>	31%	28%	21%	23%	27%
<b>EBIT</b>	<b>147</b>	<b>97</b>	<b>169</b>	<b>128</b>	
<i>EBIT Margin</i>	24%	18%	16%	9%	
Effective Tax Rate (%) <sup>(2)</sup>	6%	-8%	-20%	-2%	2%
Tax Incentives for R&D (%)	1%	6%	4%	3%	2%
<b>Debt Metrics:</b>					
LT Debt	200	364	672	1 599	1 703
ST Debt	75	108	586	220	258
Cash	144	216	312	625	800
Net Debt	132	257	946	1 194	1 161
<b>Net Debt/EBITDA</b>	<b>0,68x</b>	<b>1,65x</b>	<b>4,22x</b>	<b>3,71x</b>	<b>3,28x</b>
Market Capitalization (year end)	2 139	1 869	6 180	1 717	3 306
LT Debt/Equity	9%	19%	11%	93%	52%

Source: Company Reports; Bloomberg and Case writer Analysis

(1) EBITDA for 2019 calculated as the sum between the Result from Operations and Depreciation

(2) A Corporate Tax Rate of 25% adjusted for Tax Incentives was assumed to be a reasonable estimate for future tax expenses

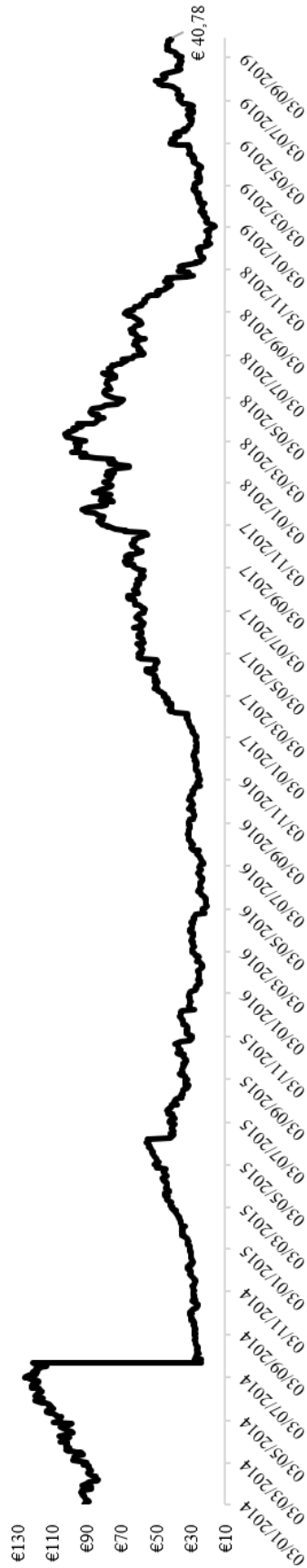
**Exhibit 3: AMS M&A Activity**

Announcement Date	Target Name	Seller Name	Announced Total Value (millions of EUR)	Payment Type
Acquisitions				
2/13/2018	KeyLemon SA	Debiopharm Group	N/A	Undisclosed
3/16/2017	Princeton Optronics Inc		50	Cash
12/19/2016	Incus Laboratories Ltd		N/A	Undisclosed
10/24/2016	Heptagon / ams Sensors Singapore Pte Ltd	Consortium of Investors <sup>(1)</sup>	524	Cash and Stock
7/26/2016	Mazet GmbH		N/A	Cash
6/16/2016	Cambridge CMOS Sensors Ltd		N/A	Cash
11/20/2015	CMOSIS Sprl	TA Associates Management LP	220	Cash
7/27/2015	CMOS Sensor business	NXP Semiconductors NV	N/A	Cash
12/04/2014	acam-messelectronic GmbH		N/A	Undisclosed
6/26/2014	Dialog Semiconductor Ltd		N/A	Undisclosed
06/04wit/2014	AppliedSensor GmbH	Verdane Capital Advisors AS	N/A	Cash
11/13/2012	IDS Group PLC		N/A	Undisclosed
6/16/2011	AMS-TAOS USA Inc		226	Cash and Stock
Divestitures				
Announcement Date	Target Name	Acquirer Name	Announced Total Value (millions of EUR)	Payment Type
11/15/2017	LED backlight technology portfolio	Dialog Semiconductor Ltd	N/A	Cash
7/29/2016	NFC & RFID reader business	STMicroelectronics NV	71	Cash

Source: Bloomberg

Note: (1) Sitra the Finnish Innovation Fund, Nokia Growth Partners Management Co Oy, GGV Capital LLC, High Tech Private Equity GmbH, InnovationsKapital Nordic Advisors AB, Innovacom Gestion SAS

Exhibit 4: AMS Share Price Performance



Source: Bloomberg

Exhibit 5: AMS's selected peer group Recent Financial Performance (in millions of CHF)

Company	Market Valuation <sup>(1)</sup>		LTM <sup>(2)</sup> Financial KPIs				LTM Profitability Margins (%)				Coverage Ratios			EV/Revenues	EV/EBITDA	EV/EBIT	EV/FCF	P/E	P/FCF	
	Market Capitalization	Enterprise Value (EV)	Revenue	Gross Profit	EBITDA	EBIT	Net Income	D/E	Debt/EBITDA	Debt/EBITDA	Net Debt/EBITDA									
ELAMOS SEMICONDUCTOR SE	529	449	290	133	85	54	42	45%	29%	19%	15%	13%	,80x	,10x	1,55x	5,26x	8,27x	,00x	12,48x	,00x
ON SEMICONDUCTOR	7 869	10 671	5 831	2 213	1 361	833	596	37%	23%	14%	10%	36%	2,06x	1,39x	1,83x	7,84x	12,81x	22,55x	13,20x	16,63x
SEMTECH CORP	3 227	3 154	624	384	162	113	63	62%	26%	18%	10%	7%	1,31x	-,41x	5,06x	19,47x	27,88x	27,44x	50,93x	28,08x
MELEXIS NV	2 793	2 800	627	281	187	138	116	40%	30%	22%	18%	2%	0,24x	,00x	4,46x	14,99x	20,32x	38,24x	24,17x	38,15x
CIRRUS LOGIC INC	3 109	2 776	1 174	592	179	100	89	52%	15%	8%	8%	0,00%	0,00x	-,247x	2,36x	15,52x	27,82x	12,81x	34,93x	14,35x
POWER INTEGRATIONS INC	2 647	2 412	398	205	71	47	62	51%	18%	12%	16%	0,24%	0,09x	-,287x	6,06x	33,79x	51,05x	59,25x	42,42x	65,03x
MONOLITHIC POWER SYSTEMS INC	6 716	6 301	589	326	126	112	109	55%	21%	19%	18%	0,03%	0,02x	-,278x	10,70x	49,97x	56,22x	57,48x	61,87x	61,26x
Mean	3 841	4 080	1 362	591	310	200	154	48,80%	23,31%	16,08%	13,59%	8,15%	0,65x	-,100x	4,57x	20,98x	29,20x	31,11x	34,29x	31,93x
Median	3 109	2 800	624	326	162	112	89	50,99%	23,33%	18,17%	14,63%	1,64%	0,24x	-,41x	4,46x	15,52x	27,82x	27,44x	34,93x	28,08x

Source: Bloomberg

- (1) As of 30/09/2019; selected Peer group based on Market Capitalization Size, i.e., companies operating in the same industry with a Market Capitalization significantly below CHF 1bn and above CHF 8bn were excluded.
- (2) Last Twelve Months; all figures refer to the twelve months prior to September, 2019

**Exhibit 6: Worldwide Smartphones' Shipment Evolution**

Player	Q4 2018 shipments (million)	Q4 2018 Market Share	Q4 2017 shipments (million)	Q4 2017 Market Share	Annual Growth
Apple	71.7	19.8%	77.3	20.0%	-7.3%
Samsung	70.3	19.4%	74.2	19.2%	-5.3%
Huawei	60.5	16.7%	41.1	10.6%	+47.3%
Oppo	31.8	8.8%	26.3	6.8%	+20.6%
Xiaomi	26.4	7.3%	27.2	7.0%	-3.0%
Others	101.8	28.1%	140.7	36.4%	-27.6%
Total	362.5	100%	386.9	100.0%	-6.3%

Source: Canalys Smartphone Analysis (sell-shipments), January 2019

**Exhibit 7: Automotive Lighting and Lighting Industries Selected Players**

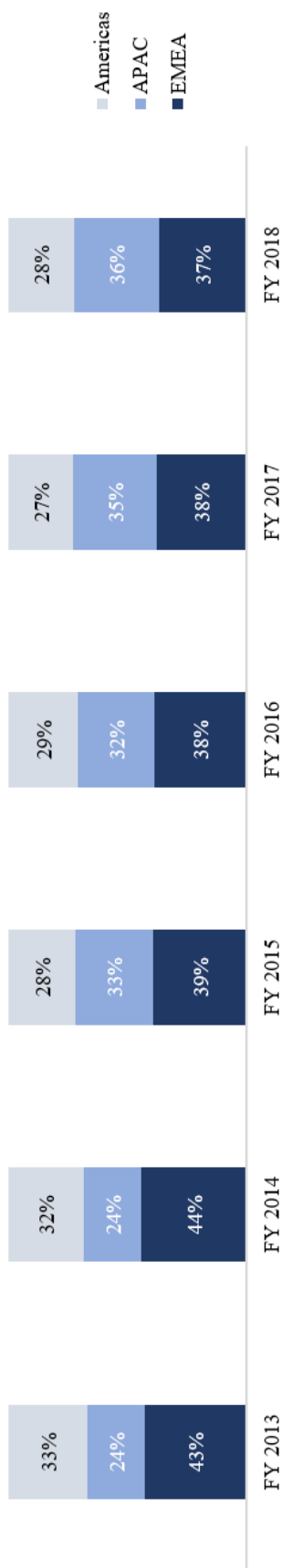
Company	Market Valuation (1)		LTM(2) Financial KPIs					LTM Profitability Margins (%)				Coverage Ratios				EV/Revenues	EV/EBITDA	EV/EBIT	EV/FCF	P/E	P/FCF
	Market Capitalization	Enterprise Value (EV)	Revenue	Gross Profit	EBITDA	EBIT	Net Income	Gross Profit	EBITDA	EBIT	Net Income	D/E	Debt/EBITDA	Debt/EBITDA	Net Debt/EBITDA						
HELLA GMBH & CO KGAA	4 979	4 859	7 995	2 062	1 306	868	722	27%	13%	8%	9%	36%	1,36x	33x	3,94x	6,08x	14,93x	6,90x	15,30x		
SCHAEFFLER AG - PREF	5 099	8 369	16 573	4 215	2 391	1 388	905	25%	14%	8%	5%	116%	2,47x	1,41x	3,95x	7,68x	17,52x	5,63x	10,68x		
SIGNIFY NV	3 531	4 552	7 334	2 743	786	506	330	37%	11%	7%	4%	50%	2,23x	1,15x	5,93x	9,58x	8,04x	10,71x	6,24x		
LEGRAND SA	19 076	22 106	7 065	3 664	1 594	1 336	912	52%	23%	19%	13%	22%	2,64x	1,86x	13,59x	16,67x	20,22x	20,92x	17,45x		
SEOUL SEMICONDUCTOR CO LTD	673	885	1 071	285	175	85	60	23%	16%	8%	6%	29,18%	1,12x	92x	7,05x	15,68x	15,27x	11,20x	11,61x		
EVERLIGHT ELECTRONICS CO LTD	395	367	752	177	96	27	25	22%	13%	4%	3%	27,26%	1,13x	-82x	4,06x	16,59x	5,87x	15,59x	6,31x		
LG INNOTEK CO LTD	2 250	3 507	6 839	732	695	210	125	8%	10%	3%	2%	84,49%	2,74x	1,95x	4,72x	14,14x	25,56x	18,00x	16,40x		
FAGERHULT GROUP AB	960	1 381	663	255	122	81	56	39%	18%	12%	8%	86,37%	6,82x	5,76x	10,25x	17,11x	17,26x	17,26x	100x		
Mean	4 620	5 753	6 037	1 767	895	563	392	29,17%	14,85%	8,56%	6,39%	56,33%	2,56x	1,57x	6,69x	12,94x	15,35x	13,28x	10,50x		
Median	2 890	4 029	6 952	1 397	741	358	227	26,35%	13,93%	7,76%	5,54%	42,77%	2,35x	1,28x	5,32x	14,91x	15,27x	13,40x	11,15x		

Source: Bloomberg

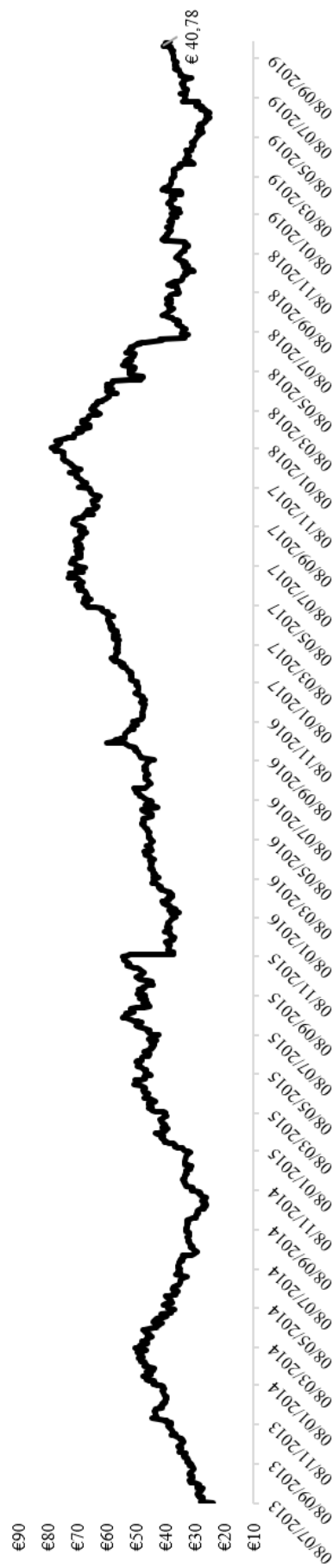
(1) As of 30/09/2019

(2) Last Twelve Months; all figures refer to the twelve months prior to September, 2019

**Exhibit 8: OSRAM's Revenue Distribution by customer location**



**Exhibit 9: OSRAM's Share Price Performance**



Source: Bloomberg

**Exhibit 10: OSRAM's Recent Financial Performance (in millions of EUR)**

	Fiscal Year			Nine months Ending June 30, 2019
	2015	2016	2017	
<b>Total Revenues: <sup>(1)</sup></b>	<b>4 098</b>	<b>4 442</b>	<b>5 022</b>	<b>3 082</b>
<u>Opto Semiconductors (OS)</u>	<u>1 292</u>	<u>1 424</u>	<u>1 685</u>	<u>1 073</u>
External Revenues	767	801	831	532
Intersegment Revenues	525	623	854	541
Automotive (AM)	<u>1 897</u>	<u>2 010</u>	<u>2 173</u>	<u>1 320</u>
<u>Digital (DI)</u>	<u>905</u>	<u>971</u>	<u>1 086</u>	<u>651</u>
Revenue Adjustments <sup>(2)</sup>	4	37	78	58
<b>Reported Revenues (net of Intersegment Revenues)</b>	<b>3 573</b>	<b>3 819</b>	<b>4 168</b>	<b>2 541</b>
<b>Margins (% of Total Revenues):</b>				
EBITDA	13,25%	13,96%	12,37%	3,93%
Adjustments to EBITDA <sup>(2)</sup>	-2,15%	-1,92%	-1,92%	-1,76%
Net EBITDA Margin	11,10%	12,03%	10,45%	2,16%
Depreciation and Amortization	5,00%	4,73%	4,46%	8,47%
EBIT Margin	8,25%	9,23%	7,91%	-4,54%
CAPEX	6,00%	7,88%	10,69%	6,33%
<b>Corporate Tax Rate</b>	<b>30,10%</b>	<b>30,40%</b>	<b>30,10%</b>	<b>30,10%</b>
<b>Effective Tax Rate (% of EBIT)</b>	<b>29,19%</b>	<b>24,11%</b>	<b>29,31%</b>	<b>27,92%</b>
<b>R&amp;D Expenses</b>	<b>286</b>	<b>334</b>	<b>364</b>	<b>318</b>
<b>Non-Current Assets:</b>				
Property, Plant and Equipment	1 115	1 060	1 396	1 516
Intangible Assets	210	190	290	632
<b>Current Assets:</b>				
Receivables	898	580	634	497
Payables	749	601	752	515
Inventories	987	655	662	761
<b>Financial Ratios:</b>				
LT Debt	50	42	184	152
Market Capitalization (year end)	3 383	3 805	4 454	4 478
LT Debt/Equity	1%	1%	4%	3%
Net Debt	-640	-395	-409	424

Source: Company Reports and Case writer Analysis

Notes: (1) Given that the company changed the Business Segment distribution for reporting purposes in 2019, the revenue distribution per Business Segment was calculated assuming: the AM segment share of total revenues for 2018 (53.14%) would be similar in the previous years; OS reporting remained unchanged; DI was calculated as the difference between Total Revenues and the remaining business segments; (2) Mainly related to Corporate Items and Pensions as well as other elements for Financial Statement Reconciliation

**Exhibit 11: OSRAM Acquisition Timeline**

Date	Type of Event	Description	Players Involved	AMS	OSRAM
05/06/2013	Spinoff	OSRAM' Spinoff from Siemens AG	OSRAM, Siemens		
01/06/2017	Exit	Siemens AG exits 100% of OSRAM	OSRAM, Siemens		2,4%
01/06/2017	Strategy Update	OSRAM changes business focus to high-tech	OSRAM		2,4%
03/12/2018	Acquisition	Buyout specialists eyeing OSRAM	OSRAM, Bain Capital, Carlyle		
25/01/2019	Business Related	OSRAM warns of a weak first quarter as it cuts jobs	OSRAM		0,6%
08/02/2019	Business Related	OSRAM's quarter dives, orders could pick up in second half	OSRAM		-4,7%
13/02/2019	Acquisition	OSRAM confirms it's in talks to be acquired, and overhauls an IoT segment	OSRAM, Bain Capital, Carlyle		13,6%
28/03/2019	Business Related	OSRAM warns that 2019 revenue will tumble	OSRAM		-12,9%
08/05/2019	Business Related	OSRAM's poor Q2 financial results	OSRAM		-0,9%
08/05/2019	Business Related	OSRAM reports €91M loss in second quarter	OSRAM		-0,9%
27/06/2019	Exit	OSRAM sells Siteco	OSRAM, Siteco		
03/07/2019	Acquisition	AMS expressed interest in the deal	OSRAM, AMS	1,3%	18,7%
03/07/2019	Acquisition	Bain Capital and Carlyle make public market play to acquire OSRAM	OSRAM, Bain Capital, Carlyle	1,3%	18,7%
15/07/2019		Non-binding expression of interest by AMS to takeover OSRAM	OSRAM, AMS		6,1%
15/07/2019		OSRAM doubts AMS' financing capacity via ad-hoc	OSRAM, AMS		6,1%
16/07/2019	Acquisition	AMS loses interest in the deal	OSRAM, AMS		-5,5%
23/07/2019	Acquisition	AMS gains interest in the deal again	OSRAM, AMS	8,3%	3,5%
31/07/2019		Q3 losses mount at OSRAM as September takeover deadline approaches	OSRAM	-5,8%	2,0%
11/08/2019		AMS woops in with offer to buy OSRAM - and dump IoT lighting	OSRAM, AMS	-11,6%	10,7%
12/08/2019		Bain's takeover bid for OSRAM hits stiff resistance	OSRAM, Bain Capital, Carlyle	-11,6%	10,7%
03/09/2019		AMS takes its OSRAM acquisition to shareholders	OSRAM, AMS	1,3%	1,8%
10/09/2019		Unscheduled free-float adjustment of OSRAM Licht AG in MDAX	OSRAM, AMS	0,4%	-0,1%
16/09/2019		OSRAM's CEO at odds with OSRAM as company backs AMS takeover	OSRAM, AMS	-1,9%	0,3%
25/09/2019		Bain jockeys to raise its offer for OSRAM	OSRAM, Bain Capital, Advent	-0,3%	2,3%
27/09/2019		AMS volleys back in OSRAM takeover bid, raising its offer to €41.00/share	OSRAM, AMS	-2,1%	5,6%
04/10/2019		AMS falls short in bid to acquire OSRAM	OSRAM, AMS	2,3%	-4,3%

Source: Case writer Analysis; Reuters; Bloomberg; LEDs Magazine

**Exhibit 12: Summary of AMS and Bain Capital proposals for OSRAM's acquisition**

Date	01/02/2019	01/07/2019	12/08/2019	25/09/2019	25/09/2019
Event	Market Capitalization prior to the Bidding War	Bain and Carlyle Offer	AMS's 1st Offer	Bain and Advent's Potential Offer <sup>(1)</sup>	AMS's Offer Raise
Share Price	37,09 €				
Offer Value		35,00 €	38,50 €	40,00 €	41,00 €
# Of Shares	96 607 000				
<b>Implied Valuation (in millions of EUR)</b>	<b>3 583</b>	<b>3 381</b>	<b>3 719</b>	<b>3 864</b>	<b>3 961</b>

Source: Case writer Analysis

Note:(1) No formal offer was made. The consortium only hinted at a potential "meaningful" premium, strategically positioned to outshine the existing offer of €38.50 per share laid out by AMS

**Exhibit 13:** AMS and OSRAM Share Price Evolution during the acquisition process between, June/2019-October/2019



Source: Bloomberg

**Exhibit 14: AMS proposed financing structure for the OSRAM acquisition**

<b>Sources (in billions of EUR)</b>	
Debt issuance <sup>(1)</sup>	2,7 (60%)
Equity issuance <sup>(2)</sup>	1,5 (33%)
Excess cash	0,3 (7%)
<b>Total</b>	<b>4,5 (100%)</b>
<b>Uses (in billions of EUR)</b>	
OSRAM offer value <sup>(3)</sup>	3,7 (83%)
OSRAM Net Debt refinancing <sup>(4)</sup>	0,4 (9%)
AMS Bank Debt refinancing <sup>(5)</sup>	0,2 (5%)
Estimated Transaction Costs	0,1 (2%)
<b>Total</b>	<b>4,5 (100%)</b>

Source: AMS presentation to investors - "Proposed acquisition of OSRAM Licht AG", September, 2019; page 14  
Notes:

(1) Primarily bond issuance; expected credit rating in BB area; part of a bridge facility with a total amount of €4.2bn fully underwritten by HSBC and UBS

(2) Primarily rights issue; issuance currency: CHF; fully underwritten by HSBC and UBS; part of a bridge facility with a total amount of €4.2bn fully underwritten by HSBC and UBS

(3) Offer price of €38.50/share multiplied by 96.8 million outstanding shares of OSRAM

(4) OSRAM Net Financial Debt as of 30/06/2019: €424 million (Long-term Debt: €128 million; Short-Term Debt: €578 million and Cash: €282 million)

(5) €235 million of AMS bank debt to be refinanced

**Exhibit 15: AMS-OSRAM Pro-forma combined leverage and Transaction Value details for the €38.50/share offer price**

<b>Proforma combined leverage</b> <i>in millions of EUR, unless stated otherwise</i>	<b>€38.50/share</b>
Acquisition Debt <sup>(1)</sup>	2 276
Refinancing OSRAM Net Debt <sup>(2)</sup>	424
ams Net Debt <sup>(2)</sup>	900
ams pensions (post-tax) <sup>(3)</sup>	40
OSRAM pensions (post-tax) <sup>(3)</sup>	122
<b>Pro-forma Net Debt (Dec-19)</b>	<b>3 762</b>
Pro-forma combined EBITDA (excl. synergies) <sup>(4)</sup>	875
<b>Pro-forma net debt / EBITDA (excl. synergies)</b>	<b>4,3x</b>
Expected run-rate synergies	300
<b>Pro-forma combined EBITDA (incl. synergies)</b>	<b>1 175</b>
<b>Pro-forma Net debt / EBITDA (incl. synergies)</b>	<b>3,2x</b>
<b>LT Target Net Debt / EBITDA for the Combined Firm</b>	<b>2,0x</b>
Pro-forma Combined Depreciation (% of Revenues) <sup>(5)</sup>	10%

<b>Transaction Valuation Details</b> <i>in millions of EUR, unless stated otherwise</i>	<b>€38.50/share</b>
OSRAM Shares Outstanding (in million)	97
Offer Price (€)	38,5
<b>Offer Value</b>	<b>3 732</b>
Cash Osram	282
Net Debt Osram	424
Minorities	120
Associates	-61
Pensions (pos-tax)	122
<b>Adj. net debt <sup>(6)</sup></b>	<b>605</b>
<b>Transaction Value</b>	<b>4 337</b>

Source: AMS presentation to investors - "Proposed acquisition of OSRAM Licht AG", September, 2019; page 20  
Notes:

(1) €2.7 bn debt issuance net of quantum required to refinance OSRAM net debt

(2) AMS management estimate ad of 31/12/2019

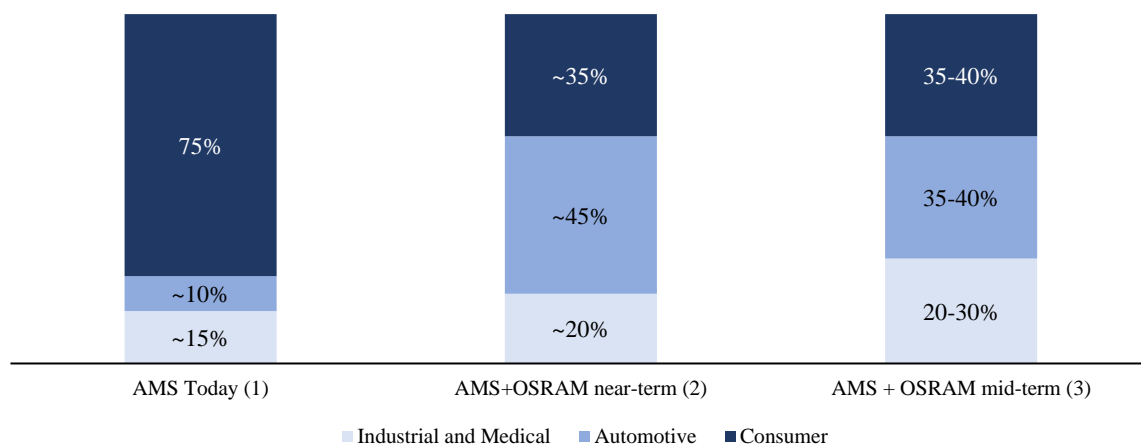
(3) Statutory Tax Rate used for Germany and Austria

(4) €850-900m pro-forma combined EBITDA based on analyst consensus and management estimates

(5) Case writer Assumption

(6) Reported as of 30/06/2019

**Exhibit 16: AMS expected revenue mix after the acquisition**



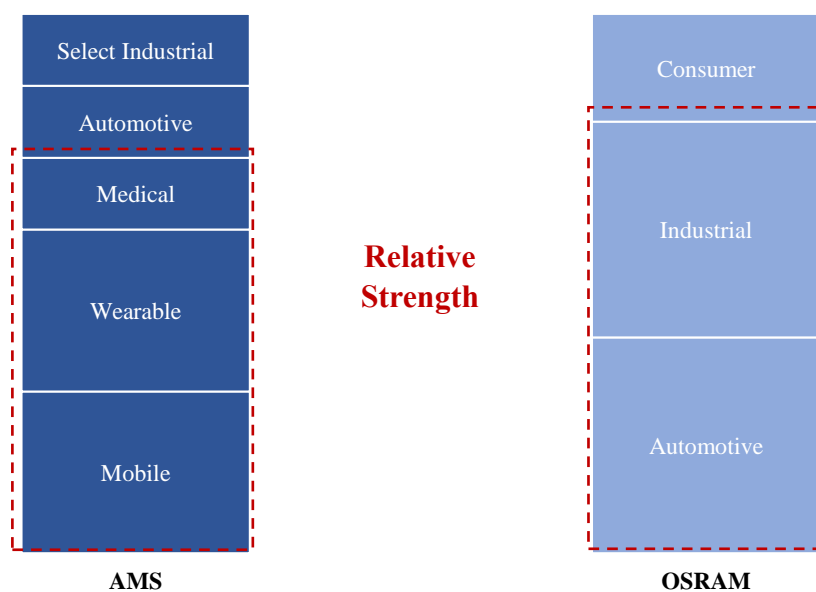
Source: AMS presentation to investors - "Proposed acquisition of OSRAM Licht AG", September, 2019; page 14  
Notes:

(1) AMS revenue mix for H1 2019

(2) Pro-forma combined revenue mix based on latest reported segment split

(3) Pro-forma combined revenue mix expected for mid-term

**Exhibit 17 : AMS and OSRAM individual go-to-market access**



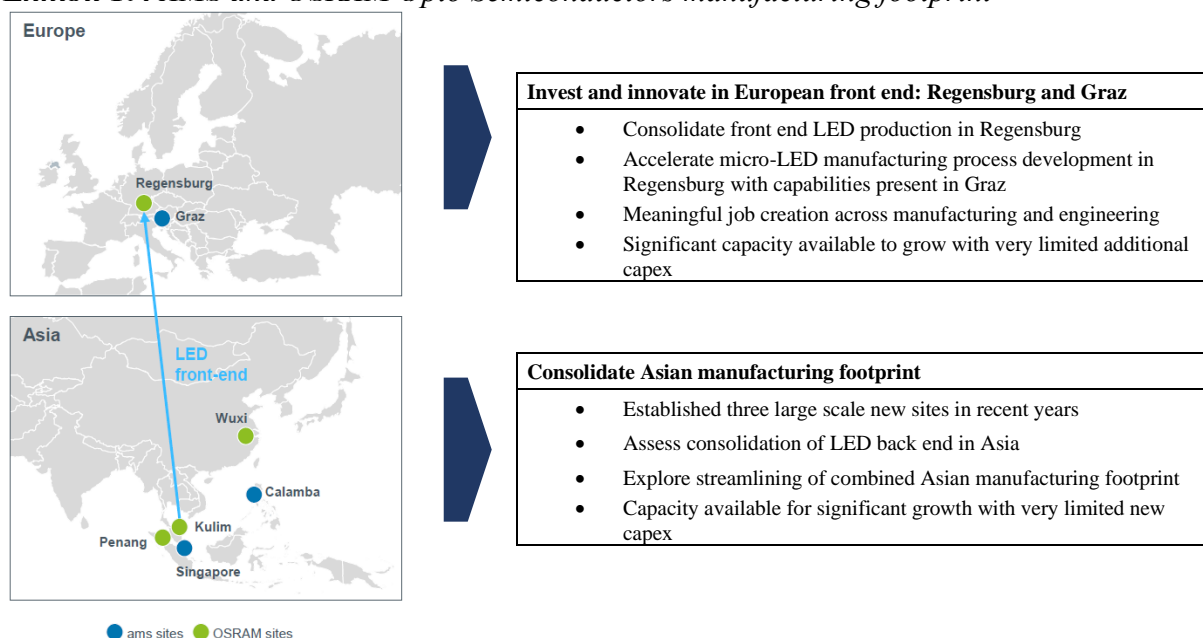
Source: AMS presentation to investors - "Proposed acquisition of OSRAM Licht AG", September, 2019; page 11

**Exhibit 18:** Expected annual run-rate of pre-tax synergies (in millions of EUR)

COGS Synergies	> 120
OPEX Synergies	> 120
Revenue Synergies	> 60
Integration Costs (one-off)	400

Source: AMS presentation to investors - "Proposed acquisition of OSRAM Licht AG", September,2019; page 12  
 Note: Run rate synergies expected to be achieved by year 3 post closing majority of synergies expected to be achieved within 2 years post-closing

**Exhibit 19:** AMS and OSRAM Opto Semiconductors manufacturing footprint



Source: AMS presentation to investors - "Proposed acquisition of OSRAM Licht AG", September,2019; page 10

**Exhibit 20: OSRAM Financial Projections (in millions of EUR)**

	Fiscal Year									
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
<b>Total Revenues:</b>	<b>4 505</b>	<b>4 786</b>	<b>5 086</b>	<b>5 406</b>	<b>5 748</b>	<b>6 075</b>	<b>6 381</b>	<b>6 660</b>	<b>6 906</b>	<b>7 068</b>
<u>Opto Semiconductors (OS)</u>	<u>1 432</u>	<u>1 544</u>	<u>1 664</u>	<u>1 795</u>	<u>1 937</u>	<u>2 073</u>	<u>2 200</u>	<u>2 314</u>	<u>2 412</u>	<u>2 468</u>
External Revenues	719	791	870	957	1 053	1 144	1 230	1 305	1 369	1 401
Intersegment Revenues	713	753	794	838	884	929	970	1 008	1 043	1 067
<u>Automotive (AM)</u>	<u>1 997</u>	<u>2 097</u>	<u>2 202</u>	<u>2 312</u>	<u>2 428</u>	<u>2 539</u>	<u>2 643</u>	<u>2 740</u>	<u>2 828</u>	<u>2 895</u>
<u>Digital (DI)</u>	<u>1 032</u>	<u>1 099</u>	<u>1 170</u>	<u>1 246</u>	<u>1 327</u>	<u>1 404</u>	<u>1 476</u>	<u>1 541</u>	<u>1 599</u>	<u>1 636</u>
<u>Adjustments</u>	<u>44</u>	<u>46</u>	<u>49</u>	<u>52</u>	<u>56</u>	<u>59</u>	<u>62</u>	<u>65</u>	<u>67</u>	<u>69</u>
<b>EBITDA Margin per segment:</b>										
<u>Opto Semiconductors (OS)</u>	24,52%	24,77%	25,02%	25,27%	25,52%	26,00%	26,00%	26,00%	26,00%	26,00%
<u>Automotive (AM)</u>	11,69%	11,19%	10,69%	10,19%	9,69%	10,00%	10,00%	10,00%	10,00%	10,00%
<u>Digital (DI)</u>	0,92%	1,67%	2,42%	3,17%	3,92%	4,67%	5,42%	6,17%	6,92%	7,67%
<u>Adjustments</u> <u>(% of Total Revenues)</u>	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%	-2,03%
<b>Capital Expenditures <sup>(1)</sup></b>	<b>369</b>	<b>381</b>	<b>405</b>	<b>430</b>	<b>457</b>	<b>486</b>	<b>514</b>	<b>539</b>	<b>563</b>	<b>584</b>
<b>Property, Plant and Equipment</b>	<b>1 947</b>	<b>2 132</b>	<b>2 318</b>	<b>2 503</b>	<b>2 689</b>	<b>2 874</b>	<b>3 059</b>	<b>3 245</b>	<b>3 430</b>	<b>3 616</b>
<b>Intangible Assets</b>	<b>852</b>	<b>998</b>	<b>1 145</b>	<b>1 291</b>	<b>1 438</b>	<b>1 584</b>	<b>1 731</b>	<b>1 877</b>	<b>2 024</b>	<b>2 170</b>

Source: Case Writer Analysis based on OSRAM Q4/FY18 Earnings Release & Strategy Update, 07/11/2018; page 43

Note: (1) Management expects Capital Expenditures to represent between 7% to 9% of revenues

**Exhibit 21: OSRAM Target Financial Performance**

	Revenue Growth		EBITDA Margin	
	Medium-Term	Long-Term	Medium-Term	Long-Term
Opto (OS)	~10%		23%	29%
Automotive (AM)	3% - 7%		9% - 11%	
Digital (DI)	3% - 8%	>10%	5% - 10%	>10%

Source: Q4/FY18 Earnings Release & Strategy Update, 07/11/2018; page 43

**Exhibit 22: Recent M&A deals within the Lasers and Lighting Industries (in millions of EUR)**

Announcement Date	Target Name	Acquirer Name	Announced Total Value	Payment Type	TV/EBITDA
<b>Lasers</b>					
11/09/2018	Finisar Corp	II-VI Inc	2 327	Cash or Stock	49,34x
2/23/2016	Newport Corp	MKS Instruments Inc	1 141	Cash	16,61x
3/16/2016	Rofin-Sinar Technologies Inc	Coherent Inc	836	Cash	12,76x
10/30/2018	Electro Scientific Industries Inc	MKS Instruments Inc	801	Cash	7,02x
<b>Lighting</b>					
12/21/2018	iGuzzini Illuminazione SpA	Fagerhult AB	370	Cash and Stock	24,77x
4/27/2017	Lumenpulse Inc	Power Corp of Canada, Management Group	365	Cash	44,72x
03/26/18	Shenzhen Changfang Group Co Ltd	n.a.	92	n.a.	14,76x
2/14/2018	CCS Inc/Japan	Optex Group Co Ltd	70	Stock	15,05x
08/08/2017	Cyalume Technologies Holdings Inc	Arsenal Capital Partners LP	49	Cash	6,05x

**Exhibit 23: Bain Capital and Advent Letter to OSRAM's Board of Directors**

“[...] The Investors offer OSRAM shareholders a consideration of EUR 35.00 in cash per OSRAM share, which represents a highly attractive premium of 27.7 percent over the volume-weighted average stock exchange price in the last month prior to 3 July 2019, i.e. the day on which OSRAM published its ad-hoc announcement. The value of the proposed Offer represents a total equity value of approximately EUR 3.4 billion and a total enterprise value of approximately EUR 4.0 billion of OSRAM. This equates to a multiple of 12.5-13x based on current adjusted EBITDA consensus forecasts of EUR 314 million for OSRAM for 2019 whereas historically, the Company has been valued with an average NTM multiple of 6-7x. In addition, the Investors are of the view that the current share price does not fully reflect the continued deterioration in OSRAM’s financial performance and the uncertainty about the Company’s overall future since 2018. Quite to the

contrary, the Investors believe that the current share price was backed due to market speculation about a possible takeover and its significant media coverage since 2018. Based on their intense work and due diligence, the Investors are therefore convinced that the offer price of EUR 35.00 is a unique opportunity for OSRAM shareholders to realize a maximum immediate and certain value uplift for their OSRAM shares independent of the challenging outlook for the Company.

Completion of the Offer will be subject to a minimum acceptance threshold of 70 percent of all OSRAM shares and further customary conditions, including merger control and foreign investment control approvals.

Management and Supervisory Board of OSRAM fully support the Offer. [...]"

*Exhibit 24: Average Debt Betas by Rating and Maturity*

<b>By Rating</b>	<b>A and above</b>	<b>BBB</b>	<b>BB</b>	<b>B</b>	<b>CCC</b>
Average Beta	<0.05	0.10	0.17	0.26	0.31
<b>By Maturity</b>	<b>(BBB and above)</b>	<b>1-5 Year</b>	<b>5-10 Year</b>	<b>10-15 Year</b>	<b>&gt;15 Year</b>
Average Beta	-	0.01	0.06	0.07	0.14

Source: S. Schaefer and I. Strebulaev, "Risk in Capital Structure Arbitrage", Stanford GSB working paper, 2009

**Exhibit 25:** Cost of Capital Assumptions for AMS and OSRAM

	AMS	OSRAM
Bloomberg 5-Year Equity Adjusted Beta (September/2015 - September/2019)	0,90	1,28
Effective Tax Rate	21,39%	27,63%

Source: Bloomberg and Case writer Analysis

	Switzerland	Germany
Risk Free Rate	1,10%	1,10%
Market Risk Premium	6,20%	5,70%

Source: Market Risk Premium and Risk-Free Rate Used for 69 Countries in 2019: A Survey

**Exhibit 26: a)** Likely Credit Rating for large non-financial manufacturing firms

Rating is	Total Debt/Capital (%)	Number of Firms
D		
C		
CC		
CCC	89,40%	23
B-		
B	74,60%	240
B+		
BB	61,30%	276
BB+		
BBB	47,40%	234
A-		
A	40,10%	150
A+		
AA	35,60%	34
AAA	26,90%	10

**b)** Implied Credit Rating for large non-financial manufacturing firms

EBIT Interest Coverage Ratio		Rating is	Spread is	Market Interest Rate on Debt
>	≤ to			
-100000	0,199999	D	15,00%	15,00%
0,2	0,649999	C	12,70%	12,70%
0,65	0,799999	CC	11,50%	11,50%
0,8	1,2499999	CCC	10,00%	10,00%

1,25	1,4999999	B-	8,00%	8,00%
1,5	1,7499999	B	6,50%	6,50%
1,75	1,999999	B+	4,75%	4,75%
2	2,2499999	BB	3,50%	3,50%
2,25	2,499999	BB+	2,75%	2,75%
2,5	2,99999	BBB	2,25%	2,25%
3	4,2499999	A-	2,00%	2,00%
4,25	5,499999	A	1,80%	1,80%
5,5	6,4999999	A+	1,50%	1,50%
6,5	8,49999	AA	1,00%	1,00%
8,50	100000	AAA	0,75%	0,75%

Source: Damodaran (2004)

**Exhibit 27: Ranking of the top 10 packaged LED manufacturers**

Ranking	2016	2017
1	Nichia	MLS
2	MLS	Nichia
3	Lumileds	Lumileds
4	Everlight	OSRAM OS
5	OSRAM OS	Everlight
6	Nationstar	240Nationstar
7	LiteOn	LiteOn
8	Hinglitrionic	Seoul Semiconductors
9	Cree	Honglitrionic
10	Seoul Semiconductors	Jufei

**BIBLIOGRAPHY**

2019. *"AMS acquires Osram"*. LEDs Magazine. December 9. Accessed November 3, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14073258/ams-acquires-osram>.
2019. *"AMS volleys back in Osram bid, raising its offer"*. LEDs Magazine. September 27. Accessed October 29, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14051330/ams-volleys-back-in-osram-takeover-bid-raising-its-offer>.
2019. *"Osram CEO at odds with Osram as company backs ams takeover"*. LEDs Magazine. September 16. Accessed October 28, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14039970/osram-ceo-at-odds-with-osram-as-company-backs-ams-takeover>.
- Allianz Global Investors. 2019. *"AllianzGI comments on takeover bid for OSRAM"*. Allianz Global Investors. August 7. Accessed November 14, 2023. <https://www.allianzgi.com/en/press-centre/media/archive-press-releases/osram>.
- ams AG. 2018. Premstaetten: ams AG, February 26. Accessed October 15, 2023. <https://ams-osram.com/documents/20143/83420/ams+annual+report+2017+complete.pdf/d8a48782-e10b-e9e6-b1f0-7e7094351361?t=1583689226887>.
- ams AG. 2015. *ams AG Annual Report 2014*. Unterpremstätten: ams AG, January 30. Accessed October 9, 2023. [https://ams-osram.com/documents/20143/82929/ams\\_Annual\\_Report\\_2014\\_Full\\_27042015.pdf/4001532e-7320-1521-91d9-b25ad52fba01?t=1520254242257](https://ams-osram.com/documents/20143/82929/ams_Annual_Report_2014_Full_27042015.pdf/4001532e-7320-1521-91d9-b25ad52fba01?t=1520254242257).
- ams AG. 2016. *ams AG Annual Report 2015*. Premstätten: ams AG, February 3. Accessed October 9, 2023. [https://ams-osram.com/documents/20143/83109/ams\\_Annual\\_Report\\_2015\\_Full\\_25042016.pdf/cce5a9a0-78e0-35c3-6de9-d86c2234c8bb?t=1520254306677](https://ams-osram.com/documents/20143/83109/ams_Annual_Report_2015_Full_25042016.pdf/cce5a9a0-78e0-35c3-6de9-d86c2234c8bb?t=1520254306677).
- ams AG. 2019. *ams AG Annual Report 2018*. Premstaetten: ams AG, February 25. Accessed October 10, 2023. <https://ams-osram.com/documents/20143/83504/ams+Annual+Report+2018+complete.pdf/ec77b7b1-6f01-7fa3-253b-661f579eea81?t=1583481651703>.
- ams AG. 2020. *ams+OSRAM MOVING FORWARD ams AG Annual Report 2019*. Premstaetten, February 24. Accessed October 4, 2023. <https://ams-osram.com/documents/20143/2234347/ams+AG+Annual+Report+2019.pdf/952e1a19-4f24-9077-9438-41de6f2cc56d?t=1588100434133>.
- ams AG. 2019. *Creating a global leader in sensor solutions and photonics - Proposed acquisition of OSRAM Licht AG*. Premstätten: ams AG, September. Accessed November 5, 2023.

- <https://ams.com/documents/20143/2234380/ams+proposed+acquisition+of+Osram+f.pdf/b8b20a67-2259-1052-6f99-871f9cceb832?t=1565585501847>.
- ams AG. 2019. *First Quarter Report 2019*. Premstaetten: ams AG, April 30. Accessed October 4, 2023. <https://ams-osram.com/documents/20143/2234347/Q1+2019+ams+report+english+f.pdf/b563125e-e928-65ea-9a7c-bda2f9b16dcd?t=1556598901207>.
- ams AG. 2019. *Half Year Report 2019*. Premstaetten, Austria: ams AG, July 23. Accessed October 10, 2023. <https://ams-osram.com/documents/20143/2234347/Q2+2019+ams+report+english+f.pdf/b9d63624-1d24-f12a-ccf8-0d0e84eae080?t=1563856181227>.
- ams AG. 2017. *Sensing is Life ams AG Annual Report 2016*. Premstaetten: ams AG, February 27. Accessed October 10, 2023. <https://ams-osram.com/documents/20143/83265/Annual+Report+ams+2016+complete+240417+f.pdf/6071e739-34ea-a506-91b9-c2f3d5c2c5fa?t=1520254342977>.
- ams AG. 2019. *Third Quarter Report 2019*. Premstaetten: ams AG, October 22. Accessed October 4, 2023. <https://ams-osram.com/documents/20143/2234347/Q3+2019+ams+report+english+f.pdf/fe48c45c-81a2-1911-46f0-e80b65b92bd9?t=1571719924487>.
- ams OSRAM. 2016. *"ams acquires high end optical packaging leader Heptagon to become clear worldwide leader in optical sensing ..."*. ams OSRAM. October 24. Accessed October 10, 2023. <https://ams-osram.com/news/press-releases/24-10-2016-ams-acquires-high-end-optical-packaging-leader-heptagon-to-become-clear-worldwide-leader-in-optical-sensing-reports-third-quarter-results>.
- . 2017. *"ams announces completion of transaction to acquire Heptagon and related capital increase"*. ams OSRAM. January 24. Accessed October 6, 2023. <https://ams-osram.com/news/press-releases/24-01-2017-ams-announces-completion-of-transaction-to-acquire-heptagon-and-related-capital-increase>.
- . 2016. *"ams announces seasoned semiconductor executive Alexander Everke as CEO"*. ams OSRAM. March 01. Accessed October 4, 2023. <https://ams-osram.com/news/press-releases/ams-announces-seasoned-semiconductor-executive-alexander-everke-as-ceo>.
- . 2018. *"ams laser arrays bring face recognition to Android-based smartphones"*. ams OSRAM. July 9. Accessed October 16, 2023. <https://ams-osram.com/news/press-releases/ams-laser-arrays-bring-face-recognition-to-android-based-smartphones>.
- . 2019. *"ams launches optical sensor which measures ambient light from behind a smartphone's OLED screen"*. ams OSRAM. January 6. Accessed September 25, 2023. <https://ams-osram.com/news/press-releases/ams-launches-optical-sensor-which-measures-ambient-light-from-behind-a-smartphones-oled-screen>.

- . 2017. *"ams signs agreement to acquire VCSEL technology leader Princeton Optronics"*. ams OSRAM. March 16. Accessed October 9, 2023. <https://ams-osram.com/news/press-releases/ams-signs-agreement-to-acquire-vcSEL-technology-leader-princeton-optronics>.
- . n.d. *"ams TCS3530 True Color Sensor with Flicker Detection"*. ams OSRAM. Accessed October 10, 2023. <https://ams-osram.com/products/sensors/ambient-light-color-spectral-proximity-sensors/ams-tcs3530-true-color-sensor-with-flicker-detection>.
- . n.d. *"History"*. ams OSRAM. Accessed September 20, 2023. <https://ams-osram.com/about-us/history>.
- . 2015. *"Investments of about €3 billion create new growth prospects for Osram"*. ams OSRAM. November 10. Accessed October 16, 2023. <https://ams-osram.com/news/press-releases/pr-10-11-2015>.
- . 2015. *"Osram lays strong foundation for future growth"*. ams OSRAM. November 10. Accessed October 16, 2023. Osram lays strong foundation for future growth.
- . n.d. *"Vertical-cavity surface emitting lasers (VCSEL)"*. ams OSRAM. Accessed October 9, 2023. [https://ams-osram.com/technology/vcSEL#:~:text=The%20ams%20OSRAM%20VCSEL%20\(VERTICAL,high%20as%20150%C2%B0C](https://ams-osram.com/technology/vcSEL#:~:text=The%20ams%20OSRAM%20VCSEL%20(VERTICAL,high%20as%20150%C2%B0C).
- Apple Inc. 2017. *"Apple unveils X"*. Youtube Video. Cupertino, California: Apple Inc., September 12. Accessed October 10, 2023. <https://www.youtube.com/watch?v=aEoVcYQ8caM>.
- . 2017. *"The future is here: iPhone X"*. September 12. Accessed October 10, 2023. <https://www.apple.com/pt/newsroom/2017/09/the-future-is-here-iphone-x/>.
- Burger, Ludwig. 2018. *"Osram cuts profit guidance on weaker U.S. dollar, slow business"*. Edited by David Evans. Reuters. April 24. Accessed November 10, 2023. <https://www.reuters.com/article/idUSASO0003RW/>.
- Burger, Ludwig, and Maria Sheahan. 2018. *"Osram shares drop after "muted" first half prompts warning"*. Edited by Georgina Prodhan and Keith Weir. Reuters. April 25. Accessed October 4, 2023. <https://www.reuters.com/article/idUSKBN1HW17S/>.
- . 2018. *"Osram shares drop after "muted" first half prompts warning"*. Edited by Georgina Prodhan and Keith Weir. Reuters. April 25. Accessed November 12, 2023. <https://www.reuters.com/article/idUSL8N1S21ZH/>.
- Carlyle. 2019. *"Bain Capital Private Equity and The Carlyle Group announce intention to launch voluntary public takeover offer for OSRAM"*. ams OSRAM. July 4. Accessed November 14, 2023. <https://www.carlyle.com/media-room/news-release-archive/bain-capital-private-equity-and-carlyle-group-announce-intention>.
- CBI Ministry of Foreign Affairs. 2014. "Electronic Lighting in the Netherlands."

- Center of Industrial Studies. 2019. "World trade of lighting." *Center of Industrial Studies*.
- Counterpoint Research. 2019. "Global Smartphone Market Declines for The First Time in CY 2018". Counterpoint Research. February 1. Accessed October 10, 2023. <https://www.counterpointresearch.com/insights/global-smartphone-market-declines-first-time-cy-2018/#:~:text=According%20to%20the%20latest%20research,consecutive%20quarter%20of%20smartphone%20decline.>
- Cremer, Andreas. 2014. "Germany's Osram appoints new CEO from January 2015". Edited by David Evans. Reuters. November 5. Accessed October 4, 2023. <https://www.reuters.com/article/idUSFWN0SV04B20141105/>.
- . 2015. "New Osram CEO has no plans for further job cuts: paper". Edited by Mark Potter. Reuters. February 25. Accessed October 11, 2023. <https://www.reuters.com/article/idUSKBN0LT20D20150225.>
- Cremer, Andreas, and Georgina Prodhon. 2017. "Osram targets further profit, sales growth in 2018". Edited by David Evans. Reuters. November 6. Accessed November 5, 2023. <https://www.reuters.com/article/idUSL5N1NC3HM/>.
- Cremer, Andreas, and Maria Sheahan. 2014. "Osram shares gain as new CEO named, restructuring takes hold". Edited by David Evans and Victoria Bryan. Reuters. November 6. Accessed October 7, 2023. <https://www.reuters.com/article/idUSL6N0SW2TF20141106/>.
- David, Ruth, Sarah Syed, and Dinesh Nair. 2018. "Bain Said to Explore Takeover Bid for Germany's Osram Licht". Bloomberg. November 27. Accessed November 14, 2023. <https://www.bloomberg.com/news/articles/2018-11-27/bain-said-to-be-exploring-takeover-bid-for-germany-s-osram-licht?leadSource=verify%20wall.>
- Deutsch, Anthony, and Thomas Escritt. 2014. "Breaking with tradition, Philips splits off lighting". Edited by David Clarke. Reuters. September 23. Accessed October 4, 2023. <https://www.reuters.com/article/idUSL6N0RO0R420140923/>.
- Deutsche Börse Group. 2019. "Unscheduled free-float adjustment of Osram Licht AG in MDAX". Deutsche Börse Group. October 10. Accessed November 30, 2023. <https://www.deutscheboerse.com/dbg-en/media/press-releases/Unscheduled-free-float-adjustment-of-Osram-Licht-AG-in-MDAX-1643150.>
- Eccles, Robbert G., Kersten L. Lanes, and Thomas C. Wilson. 1999. "Are You Paying Too Much for That Acquisition?". Harvard Business Review. Accessed December 1, 2023. <https://hbr.org/1999/07/are-you-paying-too-much-for-that-acquisition.>
- Fortune Business Inside. 2020. *Lighting Market Size, Share & COVID-19 Impact Analysis, by Lighting Type , by Application, by End User and Regional Forecasts, 2020-2027*. Fortune Business Inside.

- Gruber, Harald. 2000. "THE SEMICONDUCTOR INDUSTRY: REVIEW OF THE SECTOR AND FINANCING OPPORTUNITIES."
- Hack, Jens, and Christoph Steitz. 2015. "*Osram exec defends new strategy, says change is needed*". Edited by Louise Heavens. Reuters. December 8. Accessed October 25, 2023. <https://www.reuters.com/article/idUSL8N13X0WX20151208/>.
- Hack, Jens, Caroline Copley, and Georgina Prodhan. 2016. "*Osram's CEO clashes with Siemens over LED strategy*". Edited by Greg Mahlich and Keith Weir. Reuters. February 16. Accessed October 21, 2023. <https://www.reuters.com/article/idUSKCN0VP1MX/>.
- Halper, Mark. 2019. "*AMS falls short in bid to acquire Osram, for now*". October 2. Accessed November 2, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14067857/ams-falls-short-in-bid-to-acquire-osram-for-now>.
- . 2019. "*AMS pushes on, making a more lenient offer for Osram*". LEDs Magazine. October 22. Accessed November 2, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14069089/ams-pushes-on-making-a-more-lenient-offer-for-osram>.
- . 2019. "*AMS takes its Osram acquisition to shareholders*". LEDs Magazine. September 4. Accessed October 28, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14039222/ams-takes-its-osram-acquisition-to-shareholders>.
- . 2017. "*As lighting companies move to IoT services, everything in the business model must change*". LEDs Magazine. June 1. Accessed October 20, 2023. <https://www.ledsmagazine.com/connected-ssl-controls/article/16700637/as-lighting-companies-move-to-iot-services-everything-in-the-business-model-must-change>.
- . 2019. "*Austrian sensor company ams is interested in Osram after all*". LEDs Magazine. July 25. Accessed October 25, 2023. <https://www.ledsmagazine.com/smart-lighting-iot/indoor-networks-controls/article/14036932/austrian-sensor-company-ams-is-interested-in-osram-after-all>.
- . 2019. "*Bain jockeys to raise its offer for Osram*". LEDs Magazine. September 25. Accessed November 2, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14040642/bain-jockeys-to-raise-its-offer-for-osram>.
- . 2018. "*Buyout specialists eyeing Osram*". LEDs Magazine. December 3. Accessed October 21, 2023. <https://www.ledsmagazine.com/leds-ssl-design/networks-controls/article/16701643/buyout-specialists-eyeing-osram>.
- . 2019. "*Osram confirms it's in talks to be acquired, and overhauls an IoT segment*". LEDs Magazine. February 14. Accessed October 23, 2023. <https://www.ledsmagazine.com/leds-ssl-design/modular-light-engines/article/16699104/osram-confirms-its-in-talks-to-be-acquired-and-overhauls-an-iot-segment>.

- . 2019. *"Osram endorses latest ams takeover offer as 2019 losses mount"*. LEDs Magazine. November 12. Accessed November 3, 2023. <https://www.ledsmagazine.com/leds-ssl-design/article/14071805/osram-endorses-latest-ams-takeover-offer-as-2019-losses-mount>.
  - . 2019. *"Osram reports €91M loss in second quarter"*. May 8. Accessed October 22, 2023. <https://www.ledsmagazine.com/leds-ssl-design/networks-controls/article/16699097/osram-reports-91m-loss-in-second-quarter>.
  - . 2019. *"Osram's quarter dives, orders could pick up in second half (UPDATED)"*. LEDs Magazines. February 8. Accessed October 22, 2023. <https://www.ledsmagazine.com/leds-ssl-design/modular-light-engines/article/16699116/osrams-quarter-dives-orders-could-pick-up-in-second-half-updated>.
  - . 2019. *"Q3 losses mount at Osram as September takeover deadline approaches"*. LEDs Magazine. July 31. Accessed October 26, 2023. <https://www.ledsmagazine.com/specialty-ssl/article/14037360/q3-losses-mount-at-osram-as-september-takeover-deadline-approaches>.
  - . 2019. *"Sensor company flirted with Osram takeover"*. LEDs Magazine. July 19. Accessed October 24, 2023. <https://www.ledsmagazine.com/smart-lighting-iot/indoor-networks-controls/article/14036484/sensor-company-ams-flirted-with-osram-takeover>.
  - . 2019. *"Takeover bid for Osram hits stiff resistance"*. August 12. Accessed October 28, 2023. <https://www.ledsmagazine.com/specialty-ssl/article/14038165/takeover-bid-for-osram-hits-stiff-resistance>.
  - . 2019. LEDs Magazine. August 12. Accessed October 28, 2023. <https://www.ledsmagazine.com/specialty-ssl/article/14038199/austrian-sensor-company-swoops-in-with-offer-to-buy-osram>.
- Hekper, Mark. 2019. *"Osram unloads Siteco, but the bigger corporate sale could be stalling"*. LEDs Magazines. June 2019. Accessed October 24, 2023. <https://www.ledsmagazine.com/architectural-lighting/indoor-lighting/article/14035508/osram-unloads-siteco-but-the-bigger-corporate-sale-could-be-stalling>.
- Hodgson, Camilla. 2018. *"Apple supplier AMS in steepest fall since 2008"*. Financial Times. October 23. Accessed September 25, 2023. <https://www.ft.com/content/930e89f4-d692-11e8-a854-33d6f82e62f8>.
- Kharpal, Arjun. 2018. *"Apple's iPhone X will be killed off this year, analyst says"*. CNBC. April 20. Accessed October 12, 2023. <https://www.cnbc.com/2018/04/20/apple-iphone-x-discontinued-this-year-analyst-says.html#:~:text=Apple's%20iPhone%20X%20is%20likely,components%20for%20the%20iPhone%20X>.

- Kim, Tae. 2018. *"Analysts worry Apple iPhone sales are even worse than they thought"*. CNBC. April 2018. Accessed October 16, 2023. <https://www.cnbc.com/2018/04/19/analysts-worry-apple-iphone-sales-are-even-worse-than-they-thought.html>.
- Kirchfeld, Aaron, Dinesh Nair, and Ruth David. 2019. *"Bain, Carlyle Are Weighing a Joint Bid for Germany's Osram"*. Bloomberg. February 13. Accessed October 22, 2023. <https://www.bloomberg.com/news/articles/2019-02-13/bain-carlyle-are-said-to-weigh-joint-bid-for-germany-s-osram-js33xaft>.
- LEDs Magazine. 2013. *Osram shares begin trading on the Frankfurt and Munich Stock Exchanges*. LEDs Magazine. July 9. Accessed October 20, 2023. <https://www.ledsmagazine.com/home/article/16697260/osram-shares-begin-trading-on-the-frankfurt-and-munich-stock-exchanges>.
- Li, Lault, Cheng Ting-Fang, and Kensaku Ihara. 2018. *"Apple warns suppliers of 20% drop in new iPhone parts orders"*. NIKKEI Asia. June 8. Accessed October 12, 2023. <https://asia.nikkei.com/Business/Companies/Apple-warns-suppliers-of-20-drop-in-new-iPhone-parts-orders>.
- Markets and Markets,. 2017. *LED Lighting Market by Installation Type (New Installation and Retrofit Installation), End-Use Application (Indoor Lighting and Outdoor Lighting), Product Type (Lamps and Luminaires), and Geography - Global Forecast to 2022*. Markets and Markets.
- McGee, Patrick, and Javier Espinoza. 2018. *"Bain Capital eyes taking German lighting group Osram private"*. Financial Times. November 27. Accessed November 14, 2023. <https://www.ft.com/content/dba3f048-f274-11e8-9623-d7f9881e729f>.
- Megaw, Nicholas. 2018. *"AMS revenues climb 252% as iPhone success boosts Apple suppliers"*. Financial Times. January 29. Accessed October 10, 2023. <https://www.ft.com/content/569fc3b8-04cc-11e8-9650-9c0ad2d7c5b5>.
- Millward, Steven. 2019. *"Xiaomi sold record 119 million smartphones despite market decline"*. TECHINASIA. March 20. Accessed October 16, 2023. <https://www.techinasia.com/xiaomi-record-phone-sales-2018>.
- Murphy, Francois. 2019. *"Apple supplier AMS develops behind-screen optical sensor for phones"*. Edited by Mark Potter. Reuters. January 7. Accessed September 25, 2023. <https://www.reuters.com/article/us-ams-sensor/apple-supplier-ams-develops-behind-screen-optical-sensor-for-phones-idUSKCN1P11SW/>.
- OSRAM Licht AG. 2017. *Annual Report of OSRAM Licht Group Fiscal Year 2017*. Munich: OSRAM Licht AG, November 30. Accessed October 17, 2023. [https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram\\_2017.pdf](https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram_2017.pdf).
- OSRAM Licht AG. 2018. *Annual Report of OSRAM Licht Group Fiscal Year 2018*. Munich: Osram Licht AG, December 5. Accessed October 17, 2023. [https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram\\_2018.pdf](https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram_2018.pdf).

- OSRAM Licht AG. 2019. *Annual Report of OSRAM Licht Group Fiscal Year 2019*. Munich, December 6. Accessed October 20, 2023.  
[https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram\\_2019.pdf](https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram_2019.pdf).
- OSRAM Licht AG. 2019. *Interim Report of OSRAM Licht Group for the First Half Year of Fiscal Year 2019*. Munich: OSRAM Licht AG, May 10. Accessed November 17, 2023.  
<https://ircenter.handelsblatt.com/download/companies/osram/Quarterly%20Reports/DE000LED4000-Q2-2018-EQ-E-00.pdf>.
- OSRAM Licht AG. 2014. *Light Moves Annual Report and Yearbook of OSRAM Licht Group for Fiscal 2014*. Munich: OSRAM Licht AG, December 4. Accessed October 20, 2023.  
[https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram\\_2014.pdf](https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram_2014.pdf).
- OSRAM Licht AG. 2015. *Light Moves Annual Report of OSRAM Licht Group For Fiscal 2015*. Munich: OSRAM Licht AG, December 7. Accessed October 20, 2023.  
[https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram\\_2015.pdf](https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram_2015.pdf).
- OSRAM Licht AG. 2019. *Market environments shape the first quarter of FY19*. Munich: OSRAM Licht AG, February 7. Accessed November 17, 2023.  
<https://ircenter.handelsblatt.com/download/companies/osram/Quarterly%20Reports/DE000LED4000-Q1-2018-EQ-E-00.pdf>.
- OSRAM Licht AG. 2018. *Q4/FY18 Earnings Release & Strategy Update*. Munich: OSRAM Licht AG, November 7. Accessed November 15, 2023.  
[https://static.seekingalpha.com/uploads/sa\\_presentations/909/35909/original.pdf](https://static.seekingalpha.com/uploads/sa_presentations/909/35909/original.pdf).
- OSRAM Licht AG. 2016. *Reinventing Light for 110 Years Annual Report of OSRAM Licht Group Fiscal Year 2016*. Munich: OSRAM Licht AG, December 5. Accessed October 17, 2023.  
[https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram\\_2016.pdf](https://www.annualreports.com/HostedData/AnnualReportArchive/o/osram_2016.pdf).
- Prodhon, Georgina. 2016. "Osram CEO believes big shareholders will back strategy". Edited by Keith Weir and Mark Potter. Reuters. January 21. Accessed October 25, 2023.  
<https://www.reuters.com/article/idUSL8N1553IO/>.
- . 2017. "Osram CEO says strategy on track as automotive lifts Q1". Edited by Harro ten Wolde and Edwina Gibbs. Reuters. February 8. Accessed November 3, 2023.  
<https://www.reuters.com/article/idUSL5N1FT009/>.
- . 2016. "Osram raises forecast after strong second quarter". Edited by Louise Heavens. Reuters. April 18. Accessed October 30, 2023.  
<https://www.reuters.com/article/idUSL5N17L3R0/>.
- . 2015. "Osram says lamps carve-out will take 12 months". Edited by Maria Sheahan. Reuters. April 29. Accessed October 12, 2023.  
<https://www.reuters.com/article/idUSV9N0N100Q20150429>.

- . 2017. *"Osram says too early to decide on phase two of Malaysia chip plant"*. Edited by Arno Schuetze. Reuters. February 7. Accessed November 4, 2023. <https://www.reuters.com/article/idUSL5N1FT4D6/>.
- . 2015. *"Osram to invest in growth again, buy back shares"*. Edited by Susan Thomas. Reuters. November 10. Accessed October 20, 2023. <https://www.reuters.com/article/idUSL8N13555U20151110>.
- . 2015. *"Osram's new growth strategy hits shares"*. Edited by Maria Sheahan and David Clarke. Reuters. November 11. Accessed October 20, 2023. <https://www.reuters.com/article/idUSL8N1361I320151111/>.
- Prodhan, Georgina, and Jens Hack. 2015. *"Osram starts sales process for lamps business"*. Edited by Christoph Steitz. Reuters. November 6. Accessed October 17, 2023. <https://www.reuters.com/article/idUSFWN13103Y20151106/>.
- Prodhan, Georgina, and Victoria Bryan. 2015. *"Osram raises profit outlook after strong quarter"*. Edited by Jane Merriman. Reuters. April 16. Accessed October 15, 2023. <https://www.reuters.com/article/idUSL5N0XD4RZ20150416/>.
- Qontigo. 2019. *"Unscheduled free-float adjustment of OSRAM Licht AG in MDAX"*. Qontigo. December 10. Accessed November 30, 2023. <https://qontigo.com/unscheduled-free-float-adjustment-of-osram-licht-ag-in-mdax-2/>.
- Reuters. 2016. *"Ams Q3 revenues at 146.7 mln euros, signs agreement to acquire Heptagon"*. Reuters. October 25. Accessed October 2023, 6. <https://www.reuters.com/article/idUSL8N1CV000/>.
- Rocco, Matthew. 2018. *"Analysts cut Apple iPhone sales forecasts on supplier woes"*. Financial Times. November 13. Accessed October 12, 2023. <https://www.ft.com/content/9aafffe6-e761-11e8-8a85-04b8afea6ea3>.
- Sachgau, Oliver. 2019. *"Osram Feeds Union Anger After Backing \$4.1 Billion AMS Offer"*. Bloomberg. September 2019. Accessed November 14, 2023. <https://www.bloomberg.com/news/articles/2019-09-16/osram-rejects-ams-s-4-1-billion-bid-sticking-with-bain-carlyle>.
- Samson, Adam. 2018. *"Chipmaker AMS slumps 9% after outlook comes in far below expectations"*. Financial Times. April 24. Accessed October 12, 2023. <https://www.ft.com/content/69f7bf46-478f-11e8-8ee8-cae73aab7ccb>.
- Schuetze, Arno. 2018. *"Osram to buy back more shares, keep dividend stable despite earnings drop"*. Edited by Adrian Croft and David Goodman. Reuters. November 6. Accessed November 12, 2023. <https://www.reuters.com/article/idUSKCN1NB2EZ/>.
- Schuetze, Arno, Alexander Hübner, and Kathrin Jones. 2019. *"Osram to consider \$3.8 billion takeover bid from Bain, Carlyle"*. Edited by Douglas Busvine and Elaine Hardcastle. Reuters. July 3. Accessed October 23, 2023. <https://www.reuters.com/article/us-osram-m->

- a-bain-capital-carlyle-group/osram-to-consider-38-billion-takeover-bid-from-bain-carlyle-idUSKCN1TY20I.
- Schuetze, Arno, Georgina Prodhan, and Deena Yao. 2015. *"Osram in talks with potential buyers of lamps business -sources"*. Edited by Ludwig Burger and David Goodman. Reuters. June 30. Accessed October 20, 2023. <https://www.reuters.com/article/idUSL8N0ZG47R20150630/>.
- Sheahan, Maria. 2017. *"Osram raises 2017 guidance after strong Q2, shares climb"*. Edited by Harro ten Wolde and Edmund Blair. Reuters. May 2. Accessed November 3, 2023. <https://www.reuters.com/article/idUSL8N1I457G/>.
- . 2016. *"Osram sells lamps unit to Chinese buyers for more than 400 mln eur"*. Edited by Harro ten Wolde. Reuters. July 26. Accessed November 2, 2023. <https://www.reuters.com/article/osram-licht-ma-china-idUSF9N19T010/#:~:text=Osram%20sells%20lamps%20unit%20to%20Chinese%20buyers%20for,for%20more%20than%20400%20million%20euros%20%28%24439.3%20million%29.>
- . 2018. *"Osram slashes guidance as autos customers push back orders"*. Edited by Christoph Steitz and Alexandra Hudson. Reuters. June 28. Accessed November 12, 2023. <https://www.reuters.com/article/idUSL8N1TU4SB>.
- Sheahan, Maria, and Irene Preisinger. 2018. *"Osram warns of threat to guidance from weaker U.S. dollar"*. Edited by Subhranshu Sahu and Keith Weir. Reuters. February 7. Accessed November 5, 2023. <https://www.reuters.com/article/idUSL8N1PX0X4/>.
- Smith, Elliot. 2019. *"Apple supplier AMS surges 20% as it diversifies to Android phones"*. CNBC. April 30. Accessed September 25, 2019. <https://www.cnbc.com/2019/04/30/apple-supplier-ams-surges-20percent-as-it-diversifies-to-android-phones.html#:~:text=AMS%20is%20known%20as%20the,suspend%20dividend%20payments%20in%20February.>
- Sterling, Toby. 2016. *"Philips, Osram lighting spin-offs diverge on LED challenge"*. Edited by Sonya Hepinstall. Reuters. May 10. Accessed November 2, 2023. <https://www.reuters.com/article/idUSL5N1830KF>.
- Technavion . 2019. "Top 10 Largest LED Lighting Manufacturers in the World 2019."
- Venzon, Cliff. 2018. *"Apple moves lower after report of fewer orders"*. Financial Times. June 8. Accessed October 12, 2023. <https://www.ft.com/content/153a6bf0-6b36-11e8-8cf3-0c230fa67aec>.
- Voestalpine. n.d. *"Our history"*. Voestalpine. Accessed September 20, 2023. <https://www.voestalpine.com/group/en/group/overview/history/>.
- Wagner, I. 2019. *Global LED lighting market size from 2019-2023*. Statista.

White, Edward. 2019. "*Apple chipmaker TSMC sees slower growth ahead*". Financial Times. January 17. Accessed October 12, 2023. <https://www.ft.com/content/49cb2a8e-1a05-11e9-9e64-d150b3105d21>.

Zissis, G., Bertoldi, P., Serrenho, T. 2021. "Update on the Status of LED-Lighting world market since 2018."

## INDIVIDUAL PART – GUILHERME RAMALHO

### Case Synopsis

AMS, an Austrian semiconductor-focused producer, under the leadership of CEO Alexander Everke, finds itself in the throes of a high-profile acquisition bid for OSRAM, a lighting company, versus the American private equity fund Bain Capital. The deal is inserted in the rich lighting and semiconductor industries' history, which has, for long, been continuously shaped, not only by pioneering inventions, but also by strategic mergers, acquisitions, and restructurings.

The story unfolds with AMS's CEO, facing a pivotal moment in September 2019, when the firm fails to secure the 62.5% equity stake minimum threshold in the public markets for the takeover to be successful. Everke now faces a crucial decision: whether to escalate the bid in the takeover attempt or maintain its offer, balancing growth prospects against excessive financial leverage and shareholder interests.

The CEO and the board must consider various factors in their decision-making: integrating different corporate cultures, responding to market fluctuations, and maintaining stock price stability, all while trying to gain the support of a skeptical workforce. The case study follows AMS as it navigates these challenges, reassessing its financial approach in light of a possible counteroffer from a new Private Equity consortium composed by Bain Capital and Advent Capital, and aligning its actions with the company's long-term goals.

The case study encapsulates the multifaceted aspects of M&A, highlighting the interplay of leadership, strategic planning, and corporate decision-making in high-stakes environments.

## **Learning Objectives**

- Understanding the impact of M&A announcements on the stock prices of both parties involved
- Analyze the impact of news and company statements on shaping investor sentiment
- Understand Merger Arbitrage trading strategies
- Distinguish between the different factors impacting a company's perceived market value

## **Target Audience**

This case and its assigned questions are suitable for Masters' or MBA students who are pursuing a degree related to Business, Management, or Finance, particularly with courses such as Mergers and Acquisitions and Financial Markets. The students should have a basic knowledge of Financial Markets, namely how stock market trading reflects one's view on the true value of a company.

## **Teaching Plan**

This case should be taught during a session of at least 90 minutes. Prior to the session, students should be encouraged to read the entire case and prepare themselves accordingly by answering the proposed Assignment Questions. Given that the case study is grounded in real events, students are encouraged to undertake further investigation into the companies and circumstances to foster a more hands-on learning experience. The questions posed in the assignment are designed to provoke student engagement with critical thought and to assess the compromises inherent in real-world management choices. It is advisable to promote discussions within the classroom setting.

Within the opening 20 minutes, the case should be summarized, with the key findings being discussed by the students. Then, the instructor should display the Assignment Questions to

motivate the discussion going forward. The following 60 minutes should be allocated to assessing the fluctuations of both companies' public valuation throughout the timeframe covered in the case. Finally, the instructor should devote the final 15 minutes of the session to letting the students develop their own view on the market's interpretation of the deal.

### **Assignment Questions**

1. What factors determine the impact of M&A announcements on both the bidder and target stock prices, in the case of publicly traded companies?
2. How did the stock price of OSRAM respond during the takeover process, since the first rumors of an acquisition? What can you infer from the evolution of arbitrage spread?
3. Discuss the reasoning behind AMS's market value fluctuation after announcing their intentions and merger plan.

### **Analysis**

**Question 1)** Mergers and acquisitions (M&A's) are a widely used growth strategy, where companies seek to increase their capital base and enhance shareholder value (Andrade, Stafford, 2004), often through operational efficiencies and the realization of financial synergies (Depamphilis, 2003). The way the stock market reacts to announcements of M&As offers valuable insights on the perceived future potential of the transaction. While the immediate effects of such announcements are crucial for short-term trading strategies, it's important to recognize that stock prices are often seen as reflections of the anticipated financial benefits of a company, discounted to their present value. Synergy, in the context of M&A's, refers to the financial advantages realized when companies merge, often serving as a key motivation for such deals. Those synergies can be realized by economies of scale, vertical integrations or the adoption of more efficient technologies (Jensen, Ruback 1983). As investors recognize the potential for added value through a merger, and

if the market anticipates that the M&A transaction will enhance the combined worth of the involved companies, the share price of the target company is likely to increase in response to these expectations. In fact, as highlighted by Damodaran (2005), this is an important metric to evaluate whether the market believes in the value creation of a takeover deal, the market value of the combined company should be greater than the sum of each company's market value prior to the announcement.

As highlighted by Hietala, Kaplan and Robinson (2002), when an acquisition announcement is made, it comes with substantial information such as potential synergies, the perceived value of both the target/acquirer and the premium considered. Merely the speculation that a company may be an acquisition target can lead to fluctuations in stock prices for both the acquiring and target companies. Investors may interpret various aspects of the deal differently, such as its strategic implications, the means of financing the acquisition, the nature of the takeover (friendly or hostile), and the possibility of the deal attracting competing offers from other interested parties.

Impact on the target/bidder stock price:

Several studies have concluded that when acquisition is proposed, it's common for the stock price of the company being targeted to increase - examples of Mulherin and Boone (2000), Andrade & Stafford (2001) or more recently Bessler, Kruizenga, Westerman (2020). A key driver of this increase is the acquisition premium, where the acquiring firm offers a price above the target's current market value to gain control and provide an immediate incentive to the target's shareholders to accept such an offer. However, it's important to recognize that paying a premium is not a mandatory aspect of acquisitions.

On the other hand, there's no research consensus on the way the stock of the acquiring company reacts to a takeover announcement. The underlying principle should remain consistent: if market

investors perceive the acquisition as a value creation investment, considering the premium paid, they are likely to increase their stock holdings. Alternatively, if the perception is that the transaction will erode value, either due to overpayment, excessive leverage or high integration costs, investors may start offloading their shares. This depends on a key factor scrutinized by investors – the financing strategy of the deal and the payment method proposed. Most M&A's involve substantial capital, frequently necessitating the acquiring company to seek funding sources beyond its own cash reserves. It's often distinguished between the financing terms – cash reserves, debt or equity issuance – and method of payment – cash or shares – as one of the most important factors to consider when evaluating M&A value creation and short-term risks from the acquirer shareholders' perspective.

Financing terms & Payment method:

Financing the acquisition through debt can escalate the firm's debt-to-equity ratio, potentially putting strain on its credit rating, causing investor apprehension and increasing its equity risk premium in the market. Alternatively, financing through equity issuance results in the dilution of current shareholders' ownership stakes, which again might trigger an unfavorable reaction.

Assuming a company's management has knowledge of its inherent value, which might not be yet reflected in its stock price, they have an incentive to tailor the offer details by choosing the most profitable combination of financing and payment method for the existing shareholders. To the bidder, share payments seem to be preferred over cash payments when it perceives its shares to be overvalued or when its shareholders feel the need to exchange the transaction risk with the target's shareholders. If other factors overlap the ones described above, cash seems to be always preferred over equity payments (Bessler, Drobetz, Zimmermann 2011; Cho, Ahn 2017; Luypaert, Van Caneghem 2017). According to Fuller et al. (2002), markets tend to treat favorably cash payment

deals instead of stock payments, due to the facts described plus the information asymmetry problem combined with the uncertainty faced when valuing M&A transactions.

Although some studies have argued that the method of payment and financing terms are independent of each other and thus should also be treated separately in efficient capital markets - Bessler, Drobetz and Zimmermann (2011) and Fischer (2017) - recent empirical evidence from European M&A activity suggests that the combination of cash payment financed through debt generates higher short-term abnormal returns for the bidder's shareholders in comparison with others methods (Bessler, Kruizenga, Westerman, 2020).

Evidence on Merger Arbitrage:

Financial markets' players can position themselves to profit from the relationship between these factors, applying a variety of event-driven strategies from which it is relevant to highlight the Merger Arbitrage. This strategy aims to exploit the uncertainty and time difference between the moment an acquisition is proposed and the moment when it gets consummated, often called the Arbitrage Spread – difference between current target's stock price and the offer price for takeover. The lower (higher) the spread between the current stock price and the proposed bid offer price, the more (less) confident the market is that a deal will take place under such conditions.

When deploying a Merger Arbitrage strategy, an investor acknowledges the risk of loss if the merger/acquisition fails or if the target ends up being acquired by a different bidder. It can also incur excessive financing costs for the trade or need to close out unrealized losses in the meantime, as the transaction settlement might take longer than expected due to regulatory constraints or shareholders' approval.

Depending on payment method, arbitrageurs will set up different strategies to better position themselves to exploit this spread. In an all-cash offer, this strategy involves just buying the target's

shares at a discount to the offer price, while in a stock/mixed payment offer it typically involves buying the target and short selling the bidder's shares (in proportion to the exchange ratio announced), using then the shares received at consummation to cover the short position (Jetley, Ji, 2010).

T. Liu, J. Wu, 2014, study the short selling price pressure around mergers and to which extent it affects the actual stock price movements experienced, finding little to no interest from short sellers in cash deals. For stock-financed deals, evidence shows a spike in short selling volume on the acquirer stock around the announcement period while finding pressure by arbitrage shorting to be responsible for more than 60% of the negative market reaction.

Multiple bidders:

If the initial acquisition announcement alerts other potential buyers, sparking interest for a higher bid, this competitive dynamic can trigger a bidding war, further driving up the stock price of the company being pursued. This is a particularly interesting characteristic of our specific case as we have two possible acquirers for the same target, in an industry where transactions were frequent, with examples of established companies selling parts of their business which are either unprofitable or where the prospects do not align with the company's vision and investment opportunities (example of OSRAM's sale of general lightning lamps business). Recent studies have shown that, as might be expected, bidders tend to overpay on their premiums for publicly traded targets in the presence of other existing bids to win bidding contests.

Hussain, Loureiro (2023) approach this problem by analyzing a wide sample of international M&A transactions in the most variate industries (covering 30 countries and 19 years of data), concluding that indeed returns for the bidder's and target's shareholders become more asymmetric distributed

in an environment of higher takeover competition, where bidder's lose and the targets gain, with the overall combined value being negligible.

**Question 2)** On November 27<sup>th</sup>, 2018, it was first reported that private equity firm Bain Capital was working with financial advisors to study a takeover on OSRAM, with both sides declining to comment on the matter. This rumor was enough for OSRAM's stock price to increase 15% touching €40 in a 2-day period, a value which it quickly failed to sustain due to the disclosing of weak results for the quarter. It only bounced back on February 13<sup>th</sup>, 2019, in a 14% rally reaching again a price of €40 after OSRAM officially disclosed takeover talks with Bain Capital and the Carlyle Group, with the firms interested in a joint bid.

It's important to note that at this point there's no revelations as regards bidding prices. Given the lack of details provided, we can define this moment as when the information asymmetry is the highest, leading to the market acting off the back of companies' and media communication. With this, the management's public attitude towards takeover intentions becomes extremely relevant, indicating a higher/lower probability of a deal going through, considering that shareholders are the ultimate decision makers in this situation.

OSRAM's stock price movements following these two events are aligned with most of the research produced around stock price behavior following takeover announcements. The clear difference between the stock price behavior on those two specific days and the trajectory it was following when looking at a more extended window tells us that, while the market was severely discounting the company's value throughout those months based on poor performance and consistent profit warnings by the management, investors saw an opportunity to profit on an eventual acquisition of the company, more precisely on the perceived premium that could then be applied for such

transaction – pricing it at €40 a share which would mean a valuation for OSRAM around the €4 billion.

The further stock price decline to around €28 would allow Bain & Carlyle consortium to make the first public market bid for OSRAM at €35 per share on July 3<sup>rd</sup>, 2019, with shares rising 19% with an arbitrage spread of only 2%, in one of the highest trading volumes recorded in years. This is the point where the arbitrage spread analysis makes sense from an implied probability point of view, since only the current best public bid will be considered. The 2% spread appears too confident as a market implied probability of a deal materializing. The correction observed during the following couple days shows the way the market weighs up the different stages of approval such a deal would have to undertake. This fluctuation sparks interest on July 15<sup>th</sup>/16<sup>th</sup>, as AMS delivers its non-bidding expression of interest mentioning an acquisition for €38.5 a share, which was disregarded right away. The market reveals sensitivity to such news, with OSRAM shares rising and declining the same 5% in the two days with the arbitrage spread turning slightly negative (relative to the current official bid) due to expectations regarding AMS's involvement.

The following days show a consolidation of the market value of OSRAM, as statements from the board express cooperation with the private equity bidders, disclosing their willingness to tender their own shares at the offered price.

The arbitrage spread would widen again, showing a degree of apprehension towards the deal, on August 7<sup>th</sup>, when Allianz (OSRAM's biggest shareholder) stated it would not accept an offer at €35 as it considered the company to be worth much more, even expressing their disappointment with the management team for being so unconfident on a turnaround of their own. Such a market movement is expected to a certain extent, as the news signals both a decreased likelihood of the

deal taking place as well as the lack of confidence from the management being exposed by the company's top shareholders.

Just a week later, on August 12<sup>th</sup>, shares spiked around 11% as AMS officially enters the bidding with a €38.5 offer. However, this spike does not drive the stock price close enough to the offer price, keeping the arbitrage spread relatively high (10%) during the following days. This might be explained again by statements from OSRAM's management and employees' unions backing the private equity offer opposed to a strategic acquirer. Justifying this unlikely positioning was the increased risk of job cuts in the case AMS was to win the bid, as a good part of the synergies could be realized by aggregating common production lines, without duplicating job positions. Evidence from August 21<sup>st</sup> confirms this vision, as OSRAM's shares started an ascending trend right after the company disclosed a cooperation agreement signed with AMS, clearing the path for an acquisition which safeguards key aspects for the main shareholders as well as employees.

The market would then price an increasing likelihood of the AMS takeover materializing, with the spread shrinking consistently, until September 25<sup>th</sup> when it touched negative values following news that Bain was partnering with Advent for another bid at "an increased premium over the current €38.5", although no official offer was made. To settle the bidding war, AMS raises its bid, on September 27<sup>th</sup>, to €41 which triggers the strongest reaction on OSRAM's shares, rising another 5.5% with the largest trading volume ever recorded since IPO – 14.5 million shares. At this moment, an increased number of shareholders was already willing to tender its shares, including all the insiders who publicly disclosed their intentions regarding the acquisition. Once again, the stock price of OSRAM behaves in an expected manner, according to the research mentioned above on target's price movements, tightening (widening) the arbitrage spread as the likelihood of such offer materializing increases (decreases).

Finally, despite the market confidence in the deal (arbitrage spread of 2%) and shareholders' willingness to sell, the offer failed to achieve the minimum threshold of shares tendered. The market sits now at an uncertain position once again, expressed through the decrease in OSRAM's shares to a spread of nearly 7%. It is possible to infer that the offer price was not a concern, while other details of the tender offer might be affecting shareholders' acceptance.

**Question 3)** It's relevant to contextualize both the target and acquirer's recent stock performance, as both shareholders of AMS and OSRAM came from a difficult year of 2018. As mentioned during the case-study, besides macro-economic environment and market-specific situations common to both companies, the devaluation for AMS was mainly explained by missing revenue expectations for the year, a consequence of the growing dependency on Apple as a client. For OSRAM, the decline started as an anticipation for a stagnant year which in fact ended up being marked by a rapid decline in the automotive market, slowing down production and sales, combined with the exaggerated R&D investments intended to multiply their capacity in Asia. While the first half of 2019 was a period of recovery for AMS (almost doubling its market value by June), taking advantage of a growing market within smartphone manufacturing outside Apple, the opposite was observed in OSRAM as it wasn't being able to perform an effective turnaround, keeping its high investment rate alongside declining revenues for the more relevant segments, losing roughly a third of its value between January and June 2019.

Focusing just on AMS's stock price movements during the takeover process, the late market reaction to the company's involvement in a possible deal first comes to attention. The company's interest in an acquisition of OSRAM is first reported on July 3<sup>rd</sup>, 2019 - the same day the Bain & Carlyle consortium made its public market play to acquire OSRAM for €35 a share - but it's only then confirmed on July 15<sup>th</sup>, 2019, through a non-bidding expression of interest for OSRAM,

which could mean an acquisition for €38.5 a share and was disregarded the day after. Despite all the back and forth, AMS's shares would not be impacted and would only move on July 23<sup>rd</sup>, 2019, after stating that it had re-evaluated the possibility of a transaction after being approached by financial partners, with discussions confirming it could “arrange prudent and committed financing” - these statements came in during the second quarter results presentation where it beat profitability expectations, with shares rising 8% on the day of the announcement with a combined gain of +20% in a 4-day window period. The market was now pricing in a very healthy financial position for the company with the probability of a deal materializing, with the difference between both effects being very opaque and thus difficult to estimate. Also, as discussed on research, this might be an investment on a good company with established quality brand and hard assets at a moment of possible undervaluation due to current business and strategy constraints, thus being welcomed by the bidder's shareholders as something able to create value on their end.

On August 12<sup>th</sup>, it finally submitted its takeover proposal for €38.5 a share composed of a small portion of retained cash, €2.7 billion debt issue and €1.2 billion equity issue both already fully underwritten. The market reaction was clear to express investors' concerns on the financing strategy, with shares devaluing 11.7% on the announcement day, further declining 25% over the course of four trading days. Despite debt contraction, what was unsettling investors the most was the equity issuance part of the financing. Having complete insight into the size difference between AMS and OSRAM, one could already expect the amount of debt required to bid for such a deal. What was not being considered in the market was the possibility of an equity issuance, which would dilute current shareholders' ownership of the company while also signaling a certain degree of overvaluation from an insiders' point of view. Departing from Bessler, Drobetz, Zimmermann (2011) and Fuller et al. (2002) findings, despite paying for the transaction in cash, a company

would only resort to an equity issuance either because it exhausted the debt raising possibility or because it deems its own shares to be slightly overvalued, promoting a correction. Also, considering the difference in dimension between both companies, it is possible that investors were pricing in higher than announced integration costs.

This behavior seems consistent throughout the takeover process, as AMS's shares will move inversely to the perceived likelihood of winning the bidding. However, it is possible to observe that the volatility is way lower when for example compared with similar moves from OSRAM's stock.

## References

- Andrade, Gregor, and Erik Stafford. "Investigating the Economic Role of Mergers." *Journal of Corporate Finance* 10, no. 1 (January 2004): 1–36. [https://doi.org/10.1016/S0929-1199\(02\)00023-8](https://doi.org/10.1016/S0929-1199(02)00023-8).
- Barbopoulos, Leonidas G. "The Informational Consequences of Good and Bad Mergers," n.d.
- Bessler, Wolfgang, David Kruiuzenga, and Wim Westerman. "Stock Market Reactions to Financing and Payment Decisions for European Mergers and Acquisitions." *The Central European Review of Economics and Management* 4, no. 2 (June 2020): 41–89. <https://doi.org/10.29015/cerem.868>.
- Bessler, Wolfgang, Wolfgang Drobetz, and Matthias C Grüninger. "Information Asymmetry and Financing Decisions." *International Review of Finance* 11, no. 1 (March 2011): 123–54. <https://doi.org/10.1111/j.1468-2443.2010.01122.x>.
- Faccio, Mara, and Ronald W Masulis. "The Choice of Payment Method in European Mergers & Acquisitions," 2004.
- Fischer, Mario. "The Source of Financing in Mergers and Acquisitions." *Quarterly Review of Economics and Finance* 65 (August 2017): 227–39. <https://doi.org/10.1016/j.qref.2017.01.003>.
- Fuller, Kathleen, Jeffry Netter, and Mike Stegemoller. "What Do Returns to Acquiring Firms Tell Us? Evidence from Firms That Make Many Acquisitions." *Journal of Finance* 57, no. 4 (2002): 1763–93. <https://doi.org/10.1111/1540-6261.00477>.
- Gaughan, Patrick A. *Maximizing Corporate Value through Mergers and Acquisitions (2013)*, n.d.
- Gaurav Jetley, and Xinyu Ji. "The Shrinking Merger Arbitrage Spread: Reasons and Implications." *Source: Financial Analysts Journal* 66, no. 2 (n.d.): 54–68.
- Gugler, Klaus, and Kai A Konrad. "Merger Target Selection and Financial Structure," 2002.
- Hansen, Robert G. "A Theory for the Choice of Exchange Medium in Mergers and Acquisitions." *Source: The Journal of Business* 60, no. 1 (1987): 75–95.
- Harvard, The, and John M Olin. "This Paper Can Be Downloaded without Charge From," n.d. [http://www.law.harvard.edu/programs/olin\\_center/http://ssrn.com/abstract=2593866](http://www.law.harvard.edu/programs/olin_center/http://ssrn.com/abstract=2593866).
- Hussain, Tanveer, and Gilberto Loureiro. "Target Industry Takeover Competition and the Wealth Effects of Mergers and Acquisitions: International Evidence." *Journal of International Financial Markets, Institutions and Money* 89 (December 2023).

- <https://doi.org/10.1016/j.intfin.2023.101865>.
- Justice Kyei-Mensah, Chen Su, and Nathan Lael Joseph. “Shareholders Wealth and Mergers and Acquisitions (M&AS).” *Investment Management and Financial Innovations* 14, no. 3 (2017): 15–24. [https://doi.org/10.21511/imfi.14\(3\).2017.02](https://doi.org/10.21511/imfi.14(3).2017.02).
- Kiesel, Florian, Jörg M Ries, and Artur Tielmann. “The Impact of Mergers and Acquisitions on Shareholders’ Wealth in the Logistics Service Industry.” *International Journal of Production Economics* 193 (November 2017): 781–97. <https://doi.org/10.1016/j.ijpe.2017.09.006>.
- Lamont, Owen A, and Christopher Polk. “The Diversification Discount: Cash Flows versus Returns.” *Journal of Finance* 56, no. 5 (2001): 1693–1721. <https://doi.org/10.1111/0022-1082.00386>.
- Liu, Tingting, and Juan Julie Wu. “Merger Arbitrage Short Selling and Price Pressure.” *Journal of Corporate Finance* 27 (2014): 36–54. <https://doi.org/10.1016/j.jcorpfin.2014.04.006>.
- Martin, Kenneth J. “The Method of Payment in Corporate Acquisitions, Investment Opportunities, and Management Ownership.” *Journal of Finance* 51, no. 4 (1996): 1227–46. <https://doi.org/10.1111/j.1540-6261.1996.tb04068.x>.
- Martynova, Marina, and Luc Renneboog. “Spillover of Corporate Governance Standards in Cross-Border Mergers and Acquisitions.” *Journal of Corporate Finance* 14, no. 3 (June 2008): 200–223. <https://doi.org/10.1016/j.jcorpfin.2008.03.004>.
- Mitton, Todd, Keith Vorkink, and Marriott School. “Why Do Firms with Diversification Discounts Have Higher Expected Returns?,” n.d.
- MYERS, STEWART C. “The Capital Structure Puzzle.” *The Journal of Finance* 39, no. 3 (July 1984): 574–92. <https://doi.org/10.1111/j.1540-6261.1984.tb03646.x>.
- Myers, Stewart C. “Determinants of Corporate Borrowing.” *Journal of Financial Economics* 5, no. 2 (November 1977): 147–75. [https://doi.org/10.1016/0304-405X\(77\)90015-0](https://doi.org/10.1016/0304-405X(77)90015-0).
- Myers, Stewart C, and Nicholas S Majiuf. “CORPORATE FINANCING and INVESTMENT DECISIONS WHEN FIRMS HAVE INFORMATION the INVESTORS DO NOT HAVE,” 1981.
- Robichek, Alexander A, and Stewart C Myers. “Problems in the Theory of Optimal Capital Structure.” *The Journal of Financial and Quantitative Analysis* 1, no. 2 (June 1966): 1. <https://doi.org/10.2307/2329989>.

Steger, Ulrich, and Christopher Kummer. “Why Merger and Acquisition (M&A) Waves Reoccur—the Vicious Circle from Pressure to Failure Why Merger and Acquisition (M&A) Waves Reoccur,” n.d.

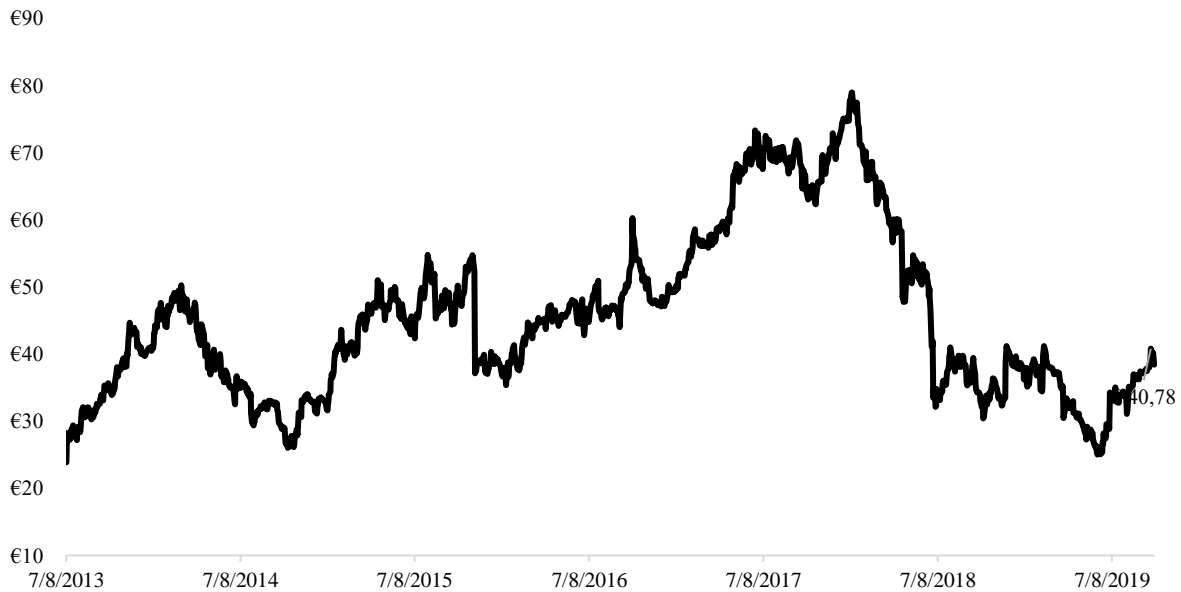
Sudi Sudarsanam, and Ashraf A Mahate. “Glamour Acquirers, Method of Payment and Post-Acquisition Performance: The UK Evidence.” *Journal of Business Finance & Accounting* 30, no. 1-2 (January 2003): 299–342. <https://doi.org/10.1111/1468-5957.00494>.

## **Appendix List**

<b>Appendix 1: OSRAM Share Price Performance.....</b>	<b>149</b>
<b>Appendix 2: AMS Share Price Performance.....</b>	<b>149</b>
<b>Appendix 3: OSRAM Arbitrage Spread Evolution during the Takeover Process.....</b>	<b>150</b>
<b>Appendix 4: OSRAM Arbitrage calculation during the Takeover Process.....</b>	<b>150</b>

## Appendix

### Appendix 1: OSRAM Share Price Performance



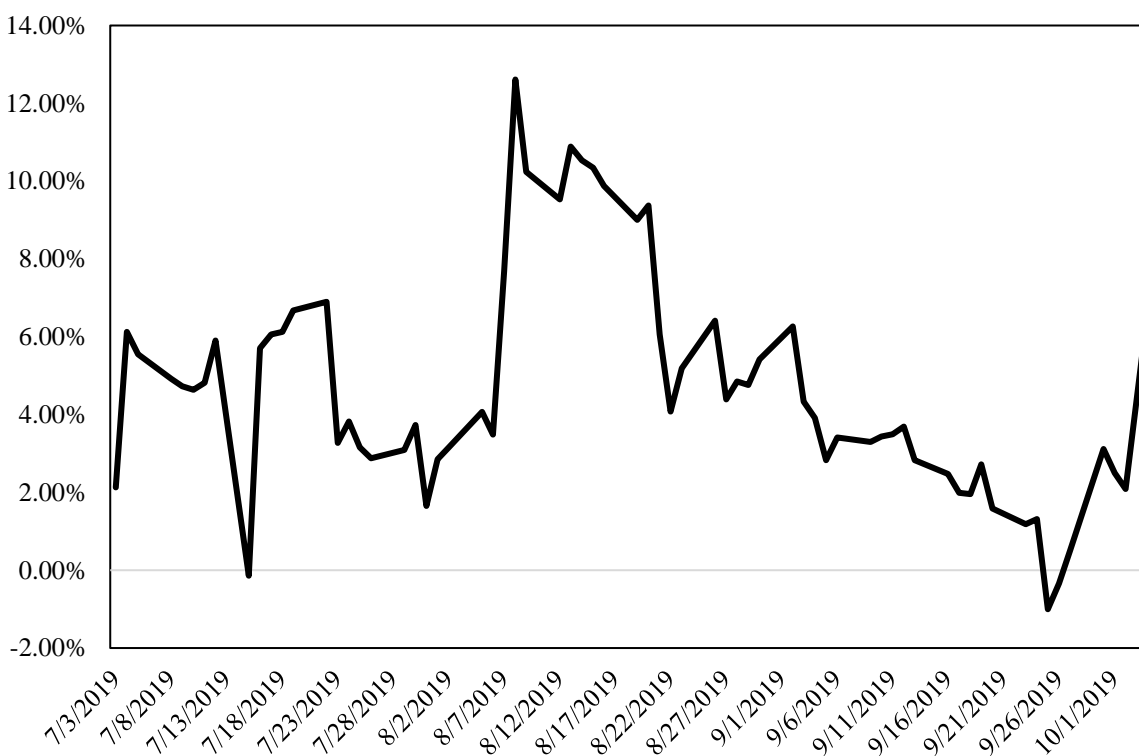
Source: Bloomberg

### Appendix 2: AMS Share Price Performance



Source: Bloomberg

**Appendix 3: OSRAM Arbitrage Spread Evolution during the Takeover Process**



**Appendix 4: OSRAM Arbitrage calculation during the Takeover Process**

Date	Closing Price	Volume	% Change	Best offer in place	Arbitrage Spread	Arbitrage Spread (% of closing price)
04/10/2019	€ 38,42	1 094 561	-4,33%	€ 41,00 €	2,58	6,72%
02/10/2019	€ 40,16	736 274	0,40%	€ 41,00 €	0,84	2,09%
01/10/2019	€ 40,00	8 245 589	0,60%	€ 41,00 €	1,00	2,50%
30/09/2019	€ 39,76	2 070 729	-2,53%	€ 41,00 €	1,24	3,12%
<b>27/09/2019</b>	€ 40,79	14 512 097	5,59%	€ <b>41,00</b> €	0,21	0,51%
26/09/2019	€ 38,63	654 512	-0,67%	€ 38,50-€	0,13	-0,34%
25/09/2019	€ 38,89	2 076 664	2,34%	€ 38,50-€	0,39	-1,00%
24/09/2019	€ 38,00	964 638	-0,13%	€ 38,50 €	0,50	1,32%
23/09/2019	€ 38,05	610 979	0,40%	€ 38,50 €	0,45	1,18%
20/09/2019	€ 37,90	1 620 365	1,12%	€ 38,50 €	0,60	1,58%
19/09/2019	€ 37,48	691 864	-0,74%	€ 38,50 €	1,02	2,72%

18/09/2019	€	37,76	463 406	0,03%	€	38,50 €	0,74	1,96%
17/09/2019	€	37,75	507 338	0,48%	€	38,50 €	0,75	1,99%
16/09/2019	€	37,57	1 259 258	0,35%	€	38,50 €	0,93	2,48%
13/09/2019	€	37,44	492 994	0,83%	€	38,50 €	1,06	2,83%
12/09/2019	€	37,13	564 934	-0,19%	€	38,50 €	1,37	3,69%
11/09/2019	€	37,20	478 710	-0,05%	€	38,50 €	1,30	3,49%
10/09/2019	€	37,22	592 565	-0,13%	€	38,50 €	1,28	3,44%
09/09/2019	€	37,27	560 985	0,11%	€	38,50 €	1,23	3,30%
06/09/2019	€	37,23	819 448	-0,56%	€	38,50 €	1,27	3,41%
05/09/2019	€	37,44	728 071	1,05%	€	38,50 €	1,06	2,83%
04/09/2019	€	37,05	1 516 125	0,41%	€	38,50 €	1,45	3,91%
03/09/2019	€	36,90	794 940	1,85%	€	38,50 €	1,60	4,34%
02/09/2019	€	36,23	570 787	-0,79%	€	38,50 €	2,27	6,27%
30/08/2019	€	36,52	740 365	-0,63%	€	38,50 €	1,98	5,42%
29/08/2019	€	36,75	481 962	0,08%	€	38,50 €	1,75	4,76%
28/08/2019	€	36,72	516 176	-0,43%	€	38,50 €	1,78	4,85%
27/08/2019	€	36,88	768 185	1,93%	€	38,50 €	1,62	4,39%
26/08/2019	€	36,18	302 619	-1,15%	€	38,50 €	2,32	6,41%
23/08/2019	€	36,60	443 954	-1,05%	€	38,50 €	1,90	5,19%
22/08/2019	€	36,99	1 230 897	1,90%	€	38,50 €	1,51	4,08%
21/08/2019	€	36,30	847 155	3,12%	€	38,50 €	2,20	6,06%
20/08/2019	€	35,20	664 411	-0,34%	€	38,50 €	3,30	9,37%
19/08/2019	€	35,32	483 898	0,80%	€	38,50 €	3,18	9,00%
16/08/2019	€	35,04	378 912	0,43%	€	38,50 €	3,46	9,87%
15/08/2019	€	34,89	744 927	0,17%	€	38,50 €	3,61	10,35%
14/08/2019	€	34,83	668 528	0,32%	€	38,50 €	3,67	10,54%
13/08/2019	€	34,72	1 516 219	-1,22%	€	38,50 €	3,78	10,89%
<b>12/08/2019</b>	€	35,15	3 247 177	10,71%	€	<b>38,50 €</b>	3,35	9,53%
09/08/2019	€	31,75	767 726	2,16%	€	35,00 €	3,25	10,24%
08/08/2019	€	31,08	2 001 705	-4,37%	€	35,00 €	3,92	12,61%
07/08/2019	€	32,50	548 041	-3,90%	€	35,00 €	2,50	7,69%
06/08/2019	€	33,82	489 562	0,56%	€	35,00 €	1,18	3,49%
05/08/2019	€	33,63	539 738	-0,88%	€	35,00 €	1,37	4,07%
02/08/2019	€	33,93	674 303	-0,29%	€	35,00 €	1,07	3,15%
01/08/2019	€	34,03	508 253	-1,16%	€	35,00 €	0,97	2,85%

31/07/2019	€	34,43	879 361	2,05%	€	35,00 €	0,57	1,66%
30/07/2019	€	33,74	746 624	-0,62%	€	35,00 €	1,26	3,73%
29/07/2019	€	33,95	442 019	-0,21%	€	35,00 €	1,05	3,09%
26/07/2019	€	34,02	456 901	0,27%	€	35,00 €	0,98	2,88%
25/07/2019	€	33,93	662 217	0,65%	€	35,00 €	1,07	3,15%
24/07/2019	€	33,71	698 805	-0,53%	€	35,00 €	1,29	3,83%
23/07/2019	€	33,89	1 687 875	3,51%	€	35,00 €	1,11	3,28%
22/07/2019	€	32,74	662 443	-0,21%	€	35,00 €	2,26	6,90%
19/07/2019	€	32,81	678 621	-0,52%	€	35,00 €	2,19	6,67%
18/07/2019	€	32,98	708 154	-0,06%	€	35,00 €	2,02	6,12%
17/07/2019	€	33,00	618 739	-0,33%	€	35,00 €	2,00	6,06%
16/07/2019	€	33,11	907 459	-5,53%	€	35,00 €	1,89	5,71%
15/07/2019	€	35,05	558 692	6,05%	€	35,00 -€	0,05	-0,14%
12/07/2019	€	33,05	822 624	-1,02%	€	35,00 €	1,95	5,90%
11/07/2019	€	33,39	696 345	-0,18%	€	35,00 €	1,61	4,82%
10/07/2019	€	33,45	992 265	0,09%	€	35,00 €	1,55	4,63%
09/07/2019	€	33,42	1 136 013	0,18%	€	35,00 €	1,58	4,73%
08/07/2019	€	33,36	1 355 636	0,60%	€	35,00 €	1,64	4,92%
05/07/2019	€	33,16	4 482 939	0,55%	€	35,00 €	1,84	5,55%
04/07/2019	€	32,98	4 910 397	-3,76%	€	35,00 €	2,02	6,12%
03/07/2019	€	34,27	2 463 630	18,75%	€	35,00 €	0,73	2,13%
02/07/2019	€	28,86	436 191	N/A	€	35,00 €	6,14	21,28%