

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

NIO Inc. Equity Research
The Next Generation of Smart Vehicles

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Abstract

In order to have a clear vision of the future of mobility, a qualitative and quantitative assessment on NIO stock were performed. Our model recommends a BUY strategy based upon three major pillars: 1) the electrification of the industry, 2) innovative charging solutions and 3) disruptive autonomous driving systems developments.

Keywords (up to four)

NIO, Automotive, Electric Vehicles, China.

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This report is part of the NIO Inc. (part 2) and should be read as an integral part of it.

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Risks

Global Chip Crisis

Exhibit 1: Losses from chip crisis by OEM

■ Ford ■ GM ■ Toyota ■ Stellantis
■ Nissan ■ VW ■ Other

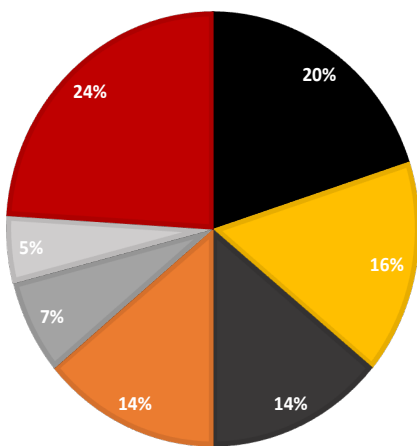
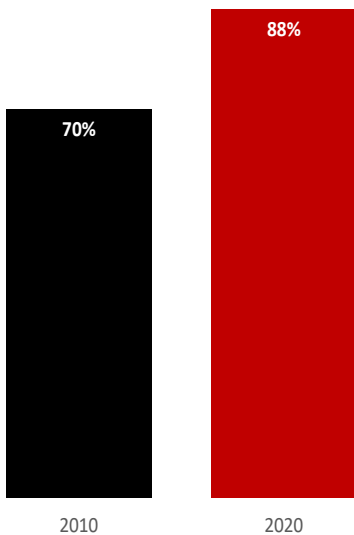


Exhibit 2: Semiconductor production capacity utilization



Semiconductors are usually not known by most people and still, they can be classified as one of the most important pieces of technology ever invented. These tiny chips are crucial for the production and performance of millions of products, such as p hones, tablets, computers, televisions, gaming consoles, washing machines, and most importantly, vehicles. On average, a modern car is made up of 1500¹ semiconductor chips mainly responsible for the conduction of electricity that supplies every interface feature as well as batteries and power trains needed for every EV. Some of the biggest players in the chip industry include companies like Intel (INTL), Qualcomm Inc. (QCOM), and Nvidia (NVDA), whose aggregate revenue volume **had surpassed \$100 billion in 2020**, with 15% of it coming from the automotive sector.

However, since the beginning of 2021, there haven't been enough semiconductors in the market to satisfy demand needs. Such a situation is known as the chip shortage crisis and it is currently affecting over 150 industries, including the automotive one, **with revenues having reduced over \$100 billion in 2021**. For instance, companies like GM, VW, Honda, and Toyota have seen most of their production plants being halted for several weeks, leading to infinite consumer queues as supply could not meet demand needs. Pure EV automakers were no exception as well. Tesla, NIO, Xpeng, and Li Auto have seen most of their deliveries being cut for consecutive months throughout 2021, besides high demand. Tesla's CEO, Elon Musk, for example, plans to delay the delivery of the new Roadster EV model to 2023. On the other hand, NIO's CEO, William Li, fears the same delay but this time regarding its brand-new sedan model, the ET7, which was initially planned to be delivered this quarter, but it is now expected to be postponed to late 2022.

The chip shortage crisis wasn't caused by a single event. Instead, a sequence of incidents triggered such a situation. It all started when the pandemic hit back in 2020 when some sectors (e.g., the auto industry) were facing big reductions in demand, while other ones faced the opposite. For example, remote work, gaming, streaming, and social media companies' demand rose to incredibly high levels, as over 100 countries settled lockdown measures by the beginning of April 2020. This meant that, on one hand, those affected industries (e.g., the auto industry) started to cut down chip orders to meet ambiguous demand forecasts, while other

¹ Source: Autocar.co.uk. 2021. *Stock take: Experts drill into the motor industry's chip issues*. <https://www.autocar.co.uk/car-news/industry-news-tech%2C-development-and-manufacturing/stock-take-experts-drill-motor-industrys>

Exhibit 3: Share of cobalt production in 2020

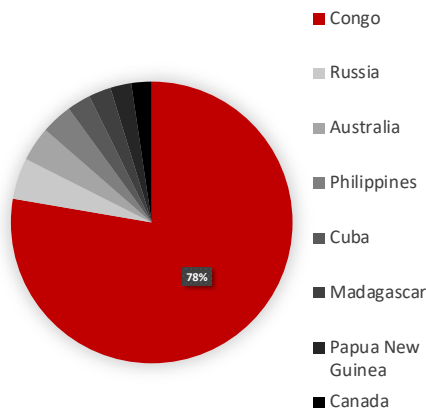
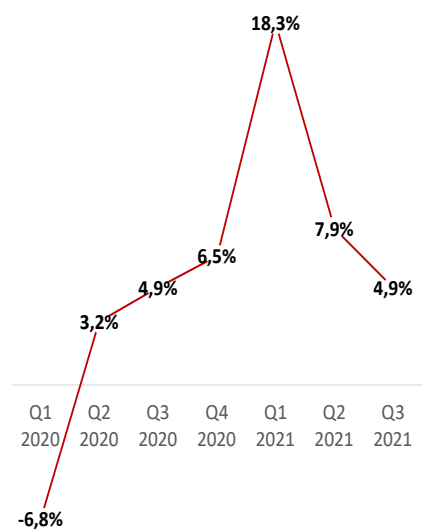


Exhibit 4: China GDP growth by quarter (constant prices)



industries increased chip orders. Then, once the pandemic started to ease in the second half of 2020, the demand of those affected industries (e.g., auto industry) began to bounce back to normal levels, which made chip orders rise even more. According to McKinsey reports, the **utilization rate of semiconductors boomed up to 88%**², which is considered as “above full utilization” by many specialists. Consequently, most chip producers began struggling to meet such high demand, which led the situation into a worldwide chip shortage crisis. Other factors, such as several geopolitical tensions and new technological improvements, also played a big role. For example, **over 70% of the world’s cobalt** (one of the most important components of a semiconductor, as previously discussed) is produced in the Democratic Republic of the Congo³, which is currently facing political turmoil, therefore limiting access to such crucial chip “ingredient”. Also, during the late 2019 US-China trade war, the US Department of Commercials imposed trade restrictions on the Semiconductor Manufacturing International Corporation (SMIC), one of the biggest semiconductor producers in the world. Consequently, many American companies with ties to the manufacturer shifted their outsourcing to companies that were already manufacturing at maximum capacities, like the Taiwan Semiconductor Manufacturing Company (TSMC). On the other hand, the appearance of more sophisticated products and services, such as the 5G rollout or the Autonomous-Driving systems in the auto industry, meant that more advanced chips began being required, which in turn made chip production processes more complex.

All in all, many events contributed to the current world shortage crisis and there is no concrete timeline for its end. Several chip-industry leaders, such as the CEO of Intel and Nvidia have reportedly confirmed they **don’t expect semiconductor supply levels to go back to normal until late 2023**⁴. This means every company affected needs to start implementing measures to soften the impact of such a shortage. For example, OEMs could start conducting more efficient short-term chip-sourcing plans according to their specific needs, or arranging dual-source manufacturing partnerships with several chip producers, or even vertically integrating their production processes, by manufacturing their semiconductors.

Evergrande’s Default

China is on the verge of a recession. The world’s second-largest economy has been losing momentum in recent quarters, having **grown just 4,9% in Q3 2021**,

² Source: Mckinsey. 2021. *Coping with the auto-semiconductor shortage: Strategies for success*. <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/coping-with-the-auto-semiconductor-shortage-strategies-for-success>
³ Source: Council on Foreign Relations. 2020. *Why Cobalt Mining in the DRC Needs Urgent Attention*. <https://www.cfr.org/blog/why-cobalt-mining-drc-needs-urgent-attention>
⁴ Source: Howley, Daniel. Yahoo Finance. 2021. *Nvidia CEO: 'We don't have any magic bullets' to deal with chip shortage*. <https://finance.yahoo.com/news/nvidia-ceo-we-dont-have-any-magic-bullets-to-deal-with-chip-shortage-212549454.html>

Exhibit 5: Evergrande's share price (1st Jan – 12th Dec, HKD)

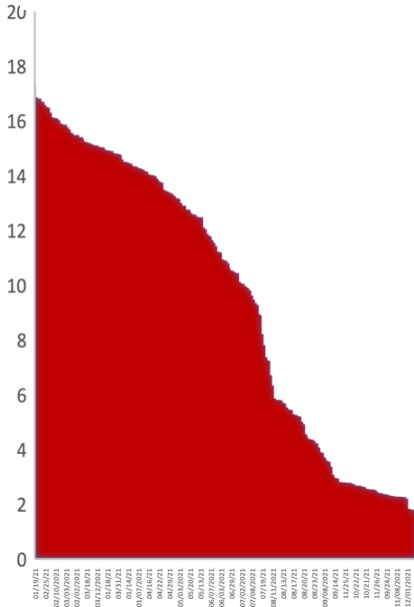
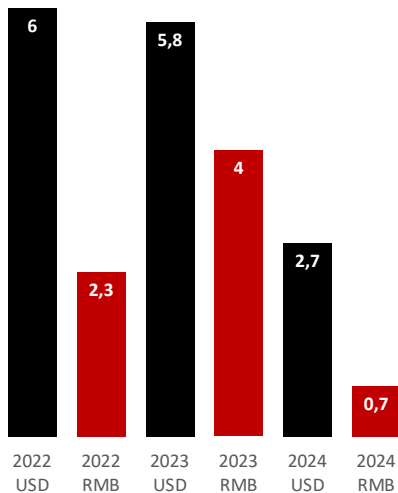


Exhibit 6: Evergrande's maturing bonds



which corresponds to the weakest rate registered since 2000, if we exclude the 1st quarter of 2020 due to the pandemic. Besides, according to Fitch Ratings, China might not reach the projected GDP growth target for 2022 once again. Who's to blame? Probably Evergrande.

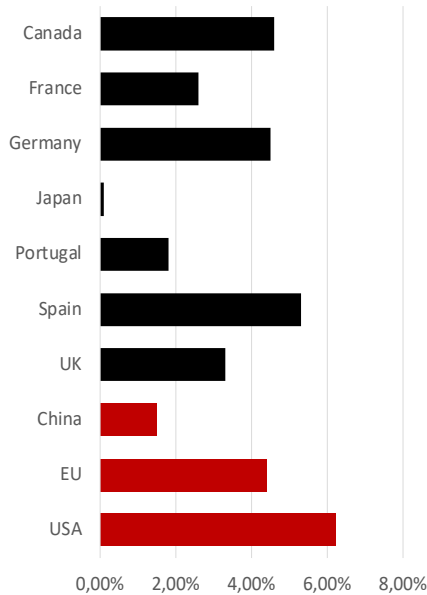
The "giant" Chinese real estate developer is currently listed in Hong Kong and is one of the biggest companies in the world, which ranked 122nd on the Fortune 500 list in 2020, with aggregated revenues of over 500 billion RMB (\$75 billion). Evergrande employs over 200,000 people and has widened, in the past few years, its business footprint towards many markets besides real estate, including the food & beverage, wealth management, sports, and automotive industries, and much more. Curiously, they even recently created their EV brand which plans to roll out electric vehicles still this year.

Although being an authentic powerhouse in China's economy, here's the problem: Evergrande's liabilities currently **amount to approximately \$300 billion**⁵, turning them into the most indebted property developer in the world. And now, due to cash-flow generation issues, Evergrande is struggling to pay its debt obligations, mainly bond interest payments. Thus, in recent months, the company did not comply with debt payment date schedules, forcing them to sell many properties at high discounts in order to get the liquidity required to pay up their short-term liabilities. However, it hasn't been enough. The company's shares have fallen over 80% in 2021 as investors fear the company's default could become a reality during the following months. If so, the ripple effects would be massive, similar to what happened in the 2008 credit default crisis. It would compromise not only millions of citizens' deposits, but also thousands of companies with businesses ties to Evergrande (e.g., construction and material manufacturing firms), and most importantly, the Chinese financial system.

Evergrande currently owns money to **over 300 financial institutions**, mostly commercial and investment domestic banks. If default occurs, all these attached entities would suffer as well, leading China's economy to a phenomenon known as credit crunch - a substantial lending activity reduction that happens when financial institutions are short in funds or simply because they have become reluctant to lend money, due to uncertain economic conditions or generalized fear of defaults or bankruptcies. Consequently, such credit supply shortages lead to higher interest rates, thus damaging the ability of consumers and companies to borrow money. This is usually reflected in a prolonged period of recession, characterized by increased unemployment, which further downgrades consumers'

⁵ Source: Bloomberg. 2021. *Evergrande's Total Liabilities Swell to Over \$300 Billion*. <https://www.bloomberg.com/news/articles/2021-09-01/evergrande-s-falling-debt-masks-dues-swelling-over-300-billion>

Exhibit 7: Inflation rate October 2021



and companies' borrowing power, leading to higher interest rates, once again. A vicious cycle, and, in its essence, the biggest risk associated with Evergrande's default.

Inflation

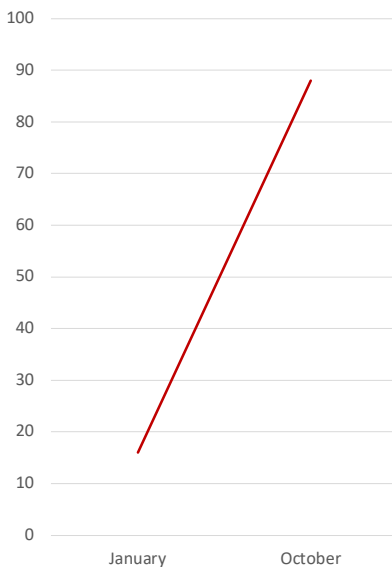
The ongoing pandemic forced the world to stop the economic activity due to the imposed lockdowns, carrying with it many financial concerns to the governments across the world. The precedent implications resulted in two main issues that are believed to be the biggest bottlenecks in today's economy: **(1) supply chain crisis (with the *Global Chip Crisis* as one example); (2) inflation.**

Inflation currently hits a 13-year all-time high in **Europe, having registered 4.1%** in late 2021; while in **the US a 6.8% inflation** has been registered, the country's highest during the last 25 years⁶. Surprisingly for some, China's inflation remains low as the economy registered only a **1.5% inflation rate in late 2021**. Besides the lockdowns and the tendency to believe inflation spike would surge similar to what happened on the other two continents mentioned, China uses tight state-dominated control on its economy.

Moreover, the picture gets intriguing in Europe, as the principal agent for the current soar prices is the energy sector with **+23.5% inflation registered in 2021**⁷. The main drivers for this were the skyrocketing natural gas prices that, according to the Dutch Title Transfer Facility (a leading benchmark in Europe), rose from €16 megawatt hourly at the beginning of January 2021 to €88 by late October 2021, a jump of more than 450%. Tim Gore, head of IEEP, attributed the ascendent prices of energy to the surge in demand for energy caused by the relaxation of pandemic restrictions combined with gas supply shortages on the global market.

Usually, these sudden inflation spikes are not a synonym of good news for most industries. The rising manufacturing costs are accompanied by rising commodity prices which consequently motivates drops in sales as the usual outcome. Nonetheless, in this specific case, this might be an opportunity for EV automakers to conquer the auto-market even further, as soaring non-renewable prices should capture more demand for electrical means of transportation.

Exhibit 8: Natural gas prices in 2021 (EUR)



Revenue Model Forecast

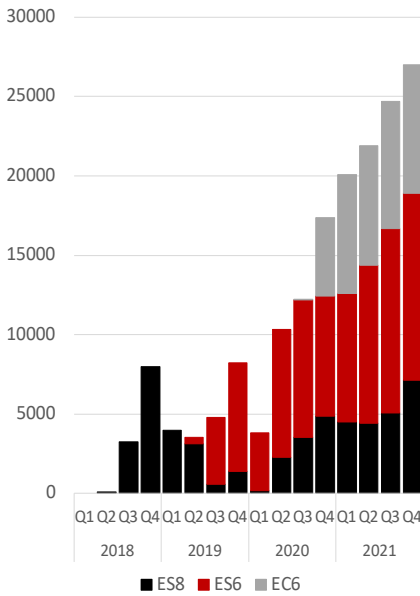
NIO's revenues are split into two categories: vehicle sales and other sales and services. The first one, as the name implies, aggregates all revenues that come

⁶ Source: Crutsinger, Martin. Spokesman. 2021. *U.S. consumer inflation up 6.8% in past year, most since 1982.* <https://www.spokesman.com/stories/2021/dec/10/us-consumer-inflation-up-68-in-past-year-most-sinc/>

⁷ Source: Euronews. 2021. *Eurozone inflation hits 13-year high amid persistent energy crunch.* <https://www.euronews.com/2021/10/29/eurozone-inflation-hits-13-year-high-amid-persistent-energy-crunch>

from the sale of battery electric vehicle models. The second one is mainly composed of the unique BaaS service (battery-as-a-service), among other revenue streams, such as regulatory credit sales and Autonomous-Driving-as-a-Service (ADaaS) subscription sales. Given this, we decided to analyze each component separately.

Exhibit 9: NIO's deliveries by model



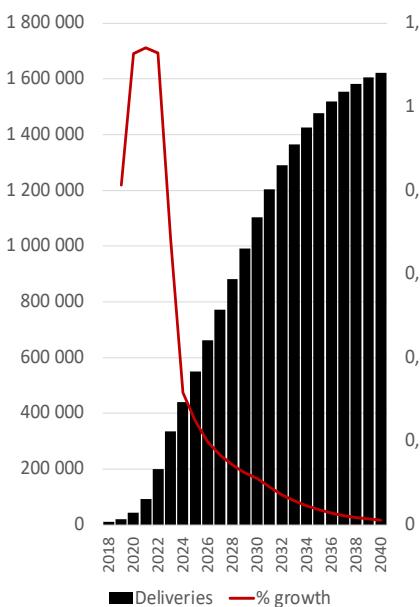
Vehicle Sales

Valuing high-growth companies can be quite challenging, with uncertainty being the main obstacle when it comes to forecasting. NIO's recent triple-digit revenue growth (107,8% in 2020 and 109,7% in 2021E) confirms this. The Chinese start-up started delivering EVs back in 2018 (11k delivered) and managed to reach almost 100k deliveries in just 3 years, on an annual basis. This corresponds to an outstanding **CAGR of 102%** (21k deliveries in 2019, 44k in 2020, and 94k in 2021E). To tackle this, we have decided to take a bottom-up forecast approach by estimating the volume of deliveries and the average price sold per annum separately.

- Delivery Volume

Let's start with the delivery volume forecast in the short-term period (2022 – 2030). By the end of the decade, the BEV industry is expected to gain some form of maturity, with the worldwide electrification rate reaching almost 50%⁸ (45m BEVs sold, out of 99m, globally, translating into a **CAGR of 34%**). NIO will be no exception. We estimate the Chinese automaker to deliver EVs at an annual pace of 32% (CAGR), reaching **1.1m in 2030**, through an aggressive expansion plan based on high R&D and Capex investments to meet increasing demand. For that, NIO executives are already taking two key actions to increase production. Firstly, the **JAC-NIO partnership** has been extended for additional three years⁹, until May 2024. The new underlining agreement states JAC to double up its production capacity to NIO models from 120k to **240k units per year**. Secondly, and most importantly, comes the **NeoPark**¹⁰, a mega-manufacturing facility already in construction and expected to become fully operational by the end of the decade. This 17k acre factory, located also in Hefei like the JAC one, and will be the world's biggest smart electric vehicle industry park, with an annual production capacity of **1 million EVs and 100 GWh of battery**. Such news surged at the beginning of the 2Q of 2021, which took everyone by surprise due to the size and potential of

Exhibit 10: NIO's EV delivery forecast until 2040



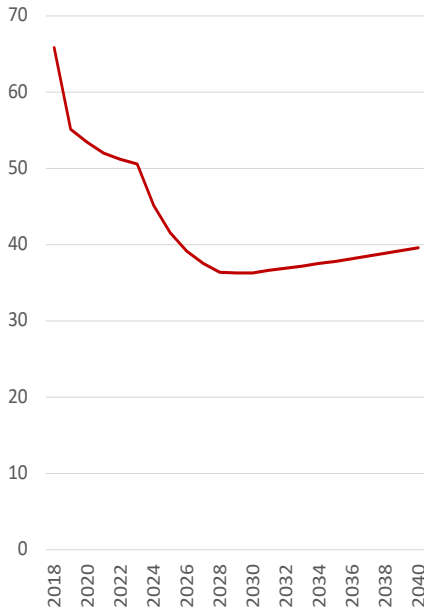
⁸ Sources: (i) Deloitte. 2020. *Electric Vehicles: Setting the course for 2030*. <https://www2.deloitte.com/us/en/insights/focus/future-of-mobility/electric-vehicle-trends-2030.html>

(ii) Barrons. 2021. *Electric Vehicles Will Rule the World By 2040. The Winners and Losers*. <https://www.barrons.com/articles/tesla-stock-gm-ev-winners-5162437248>

⁹ Source: NIO. 2021. *NIO Announces Renewal of Joint Manufacturing Arrangements*. <https://ir.nio.com/news-events/news-releases/news-release-details/nio-announces-renewal-joint-manufacturing/>

¹⁰ Source: NIO. 2021. *NeoPark officially kicks off*. <https://www.automotiveworld.com/news-releases/nio-neopark-officially-kicks-off/>

Exhibit 11: ASP Forecast until 2040



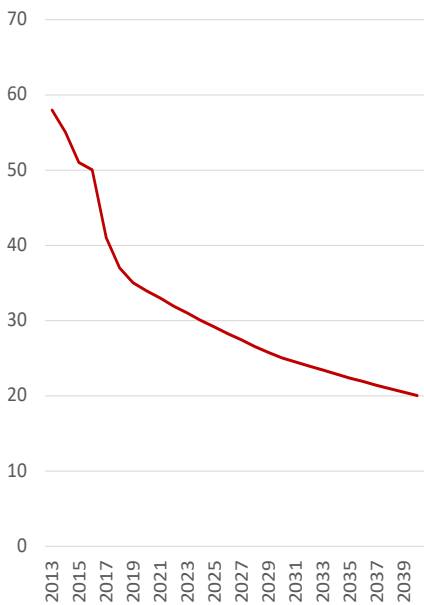
the project. According to NIO’s CEO William Li in the 1st quarter earnings conference, NIO will be the major investor in the park and therefore should be able to utilize all of its resources, although other companies might benefit from NeoPark’s facilities at a later stage. Given this, our estimations were based on **960k units per year** that should be generated to NIO in the NeoPark by 2030.

Summing up, we forecast NIO’s 2030 production capacity to come from two different streams in China: the JAC-NIO partnership (240k) and the NeoPark (960k), thus giving it a total of 1.2m EVs produced per annum. However, due to unpredictable external factors, such as chip shortage events, we took a conservative 91.9% rate of inventory sold, which translates into 1.1m EVs delivered. To finalize, our long-term delivery volume forecast (2031 – 2040) was based on the expected growth of similar EV specialists like Tesla, XPENG, and Li Auto which, are predicted to grow from 9.1% in 2031⁸ down to a stabilized growth of 1.1% at the steady-state (2040). This means NIO should deliver **1.6m EVs in 2040**.

▪ Average Selling Price (ASP)

Before going through with the average selling price (ASP) forecast, it’s necessary to explain an important piece of information that was taken from the first two board meetings this year¹¹ – NIO will enter the **automotive mass market in 2024** with the creation of a new brand. This means the Chinese automaker will start delivering two types of EVs: premium ones (current models), and low-priced ones (mass-market models). According to a study conducted by JD Power Automotive¹², **the gap between the satisfaction rate of mass-market vehicles and premium vehicles** is tending to become more **insignificant throughout time**. Such satisfaction rates were based on customer surveys taken from 2013 to 2019 at a 0 to 1000 points satisfaction range. According to the data, mass-market satisfaction rates got an increase of 4.1% during the period (from 786 pts in 2013 to 818 pts in 2019), while premium ones got only a 1.1% rate (from 844 in 2013 to 853 in 2019), corresponding to a gap decrease of 23 points, a negative CAGR of 8.07%. In the long-term (2040), an estimated gap of 20 points has been estimated at the steady-state, meaning, regardless of the descendent trajectory, the premium market will always have more customer satisfaction than mass-market, ceteris paribus. Given this, we estimate the automotive mass-market to grow up to a strong **88.9%** penetration by 2040, from a reported 81.2% in 2020. This indicates

Exhibit 12: Premium vs mass markets satisfaction rate gap forecast until 2040



¹¹ Source: (i) NIO. 2021. *NIO Inc. First Quarter 2021 Earnings Conference Call*. <https://ir.nio.com/news-events/events/event-details/nio-inc-first-quarter-2021-earnings-conference-call/>

(ii) NIO. 2021. *NIO Inc. Second Quarter 2021 Earnings Conference Call*. <https://ir.nio.com/news-events/events/event-details/nio-inc-second-quarter-2021-earnings-conference-call/>

¹² Source: J.D. Power. 2020. *Increase in Digital Automotive Retail Due to Pandemic Paves Way for New Normal, J.D. Power Finds*. <https://www.jdpower.com/business/press-releases/2020-us-sales-satisfaction-index-ssi-study>

Exhibit 13: Premium vs mass market penetration rate forecast until 2040

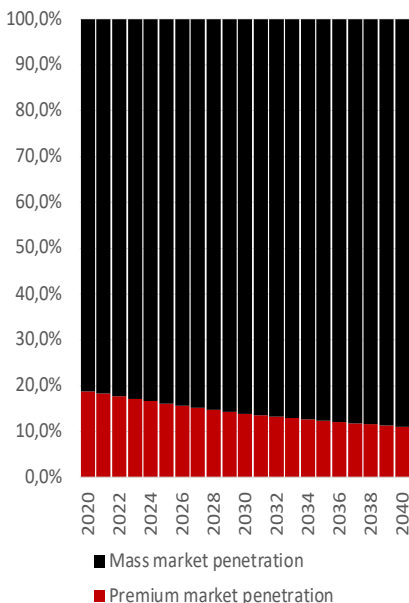
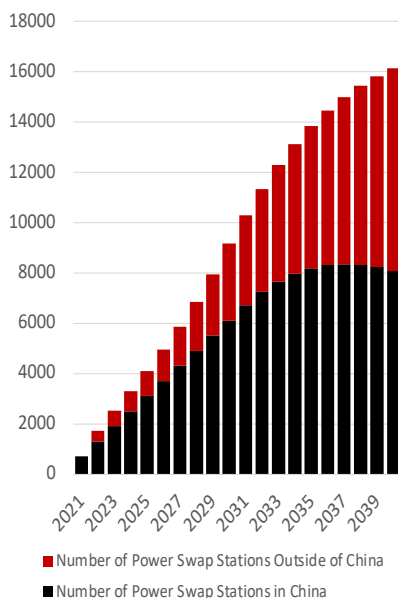


Exhibit 14: NIO's power swap stations forecast until 2040



average cars are getting fancier and more appealing to customers, in detriment to high-priced luxury ones. Following the reasoning, we assumed NIO’s mass-market brand would reach, gradually, such a penetration rate. Regarding the average price of each NIO’s car segment, three important price determinants were considered: 1) the weighted average price of battery packs for EVs (\$ per kWh); 2) mass-market average car price; and 3) inflation. The most important factor is certainly the effect of adding a low-priced car to the portfolio (mass market entrance) since the addition of a \$35,000¹³ car from 2024 onwards will reduce significantly the average price sold, given NIO current models are all priced \$50,000 and above. Furthermore, the continuous price decrease of battery packs is also an important factor to consider. Battery prices are expected to fall below \$100 per kWh by 2023, \$60 by 2030, and \$39 per kWh by 2040¹⁴. Finally, considering an expected inflation rate of 2.01%¹⁵, we expect NIO’s average selling price to go from \$51,000 (332,000 RMB), in 2022, down to **\$40,000** (259,000 RMB) in 2040.

Taking both the volume delivered and average price estimates into consideration, NIO’s vehicle revenues are forecasted to grow at a CAGR of 15% until 2040, which translates revenues of **\$4.8 billion** (31.6 billion RMB) in 2021 up to **\$40.4 billion** (262.6 billion RMB) in 2030 and **\$64.7 billion** (421.1 billion RMB) in 2040.

Other Sales and Services

- NIO Power (Battery-as-a-Service)

In August of 2020, NIO established a battery asset management company along with its main supplier CATL (Contemporary Amperex Technology Company) to sell Battery-as-a-Service (BaaS) to its customers. This service consists of a monthly subscription which enables NIO owners to swap their used car batteries for new ones on every BaaS station. As previously mentioned, swapping a battery takes, on average, only 3 minutes for the vehicle to receive a new fully charged one, whereas a traditional supercharger takes, on average, 75 minutes. Moreover, BaaS is a much cheaper option as the service provides 6 swaps per month which translates into 1500 miles of range, thus providing a convenient solution to resolve one of the most problematic issues when it comes to buying an EV, namely range.

NIO currently charges around **\$150 (980 RMB) and \$230 (1,480 RMB) per month**, for their 70kWh and 100kWh battery pack swapping service, respectively.

¹³ Conservative assumption based on the following source: Szymkowski, Sean. Road Show. 2021. Average new car price crosses \$40,000 in 2020 and that's nuts. <https://www.cnet.com/roadshow/news/average-new-car-price-2020/>

¹⁴ Source: EU Science Hub. 2018. Lithium-ion batteries will become at least 50% cheaper in the next decade. <https://ec.europa.eu/jrc/en/science-update/lithium-ion-batteries-mobility-and-storage-applications>

¹⁵ Source: PWC. 2021. Global Economy Watch – Projections. <https://www.pwc.com/gx/en/research-insights/economy/global-economy-watch/projections.html>

Exhibit 15: BaaS cumulative subscription forecast until 2040 (million subscription)

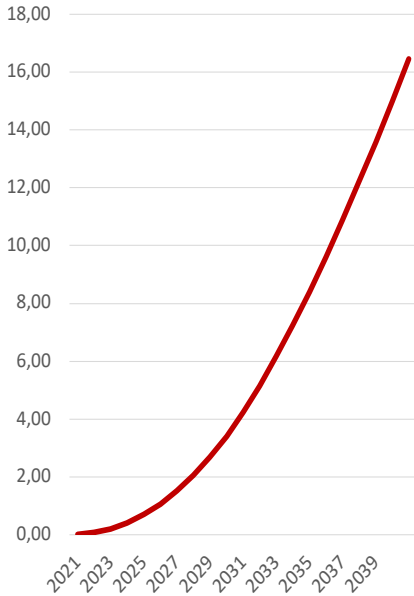
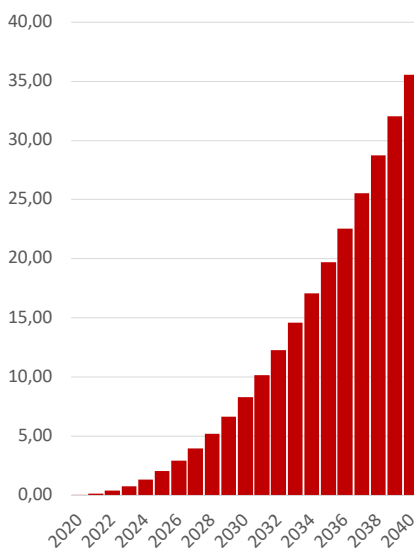


Exhibit 16: BaaS revenue forecast until 2040



Furthermore, NIO owners benefit from a substantial reduction of their original vehicle price of about \$10,800 and \$19,600 for each BaaS subscription plan chosen (70kWh or 100 kWh, respectively), thus making NIO cars more competitive price-wise compared to its competitors. This equates to 5.9 years and 7.2 years for BaaS subscribers to break even, given the monthly subscription fee and EV discount provided (again, respective to each BaaS plan). Additionally, BaaS enables its customers to be constantly up to date with the latest battery technology upgrades with no extra costs, while the ones that decide not to opt for BaaS take the risk of having outdated batteries, incurring, consequently, higher costs for battery maintenance. Finally, BaaS also warrants NIO’s vehicle owners to purchase batteries daily, preserving this way the resealing value and reducing, therefore, the concerns regarding battery degradation.

Even though the major driver of NIO’s revenues is vehicle sales, the automaker plans to invest significantly in the BaaS, with over 700 Power Swap Stations already built throughout China. According to the automaker’s CEO on a recent quarterly earning’s call, **the plan is to have 4,000 stations by 2025**, 1,000 of which are located outside of China¹⁶. We estimate such a number to increase up to 9,000 by 2030 (6,000 in China and 3,000 worldwide) and 16,000 total stations by 2040 (8,000 in China and 8,000 worldwide). Moreover, NIO has been very keen on upgrading it. As previously mentioned, in April 2021, the automaker has kicked off the development and deployment of the **Power Swap Station 2.0** together with Sinopec and Shell, the second generation of power stations which increased the capacity up to 312 swaps per day, by reducing the battery-swapping time and increasing the number of battery packs stored.

Regarding the BaaS subscription penetration rate (monthly delivery percentage with BaaS subscribed), the latter has already surpassed 50% and we estimate it to boost up to 75% by the end of the decade and up to 90% by 2040. This gives NIO’s BaaS subscriptions an exponential growth effect, which we estimate to boost up to from **5 million subscribers by 2030** and **16 million by 2040**, from the current 100,000 subscriptions. This corresponds to revenues of \$8 billion (53 billion RMB) by 2030 and \$36 billion (231 billion RMB) by 2040 (33% CAGR), given the BaaS ASP of \$166¹⁷ (1080 RMB).

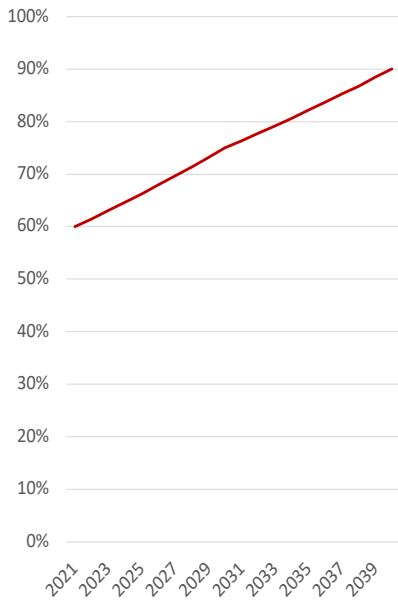
- NIO AD (Autonomous-Driving-as-a-Service)

NIO has been developing Advanced Driver-Assistance Systems (ADAS) since the launch of its first SUV model (ES8), through NIO Pilot’s Selected Pack and

¹⁶ Source: NIO. 2021. *NIO Announces NIO Power 2025 Battery Swap Station Deployment Plan*. <https://www.nio.com/news/nio-announces-nio-power-2025-battery-swap-station-deployment-plan>

¹⁷ Assumption: 80% subscribe to the 70 kWh 150 USD BaaS plan

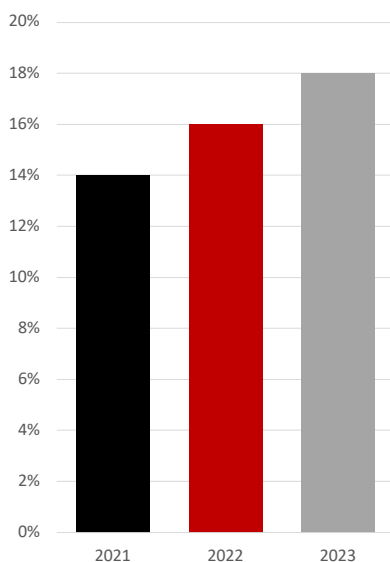
Exhibit 17: BaaS subscription penetration rate forecast



Complete Pack, each priced at \$2,300 (15,000 RMB) and \$6,000 (39,000 RMB), respectively. While the low-priced pack provides premium features such as adaptive cruise controls, automatic self-parking systems, and road-lane adjustors; the most expensive one enables all the prior, plus features like passing other cars autonomously, navigating pre-determined routes, or detecting available parking slots.

Given the fact NIO Pilot is not a service itself, but instead an additional premium package NIO customers may buy, it was therefore included in the ASP analysis above. Nonetheless, it is still important to understand what comes next: **NIO’s Autonomous Driving systems (NAD)**, the ultimate ADAS, equipped with NIO Aquila Super Sensing system and NIO Adam Super Computing¹⁸, both composed by Nvidia’s hardware together as well as a variety of highly advanced sensors. NAD will be equivalent to Tesla’s Autopilot, which is capable of autonomously driving an electric car from point A to point B, covering the usage of highways, urban roads, parking, and even battery swapping on every Power Swap Station. The latter will be provided in the newest NIO ET7 sedan model (scheduled to come out this year), through an Autonomous-Driving-as-a-Service business model (ADaaS) - a subscription plan that will be priced at about **\$100 per month (680 RMB)**.

Exhibit 18: Percentage of EV sales by year according to Chinese mandate



Although there are still many concerns regarding the effectiveness of emerging technologies such as Autonomous Driving, we believe these should completely revolutionize the automotive industry, in the long term. Therefore, we forecast NIO to capitalize on NAD investments within the next decade (starting in 2030 onwards), as opposite to BaaS, which we expect to be capitalized on in the next couple of years.

- **Regulatory Credit Sales**

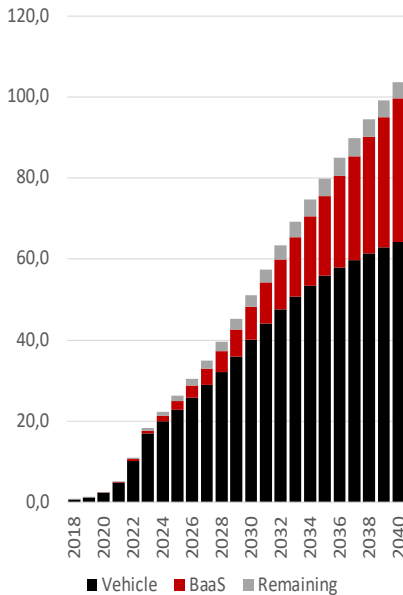
To reduce carbon dependency, China and many other countries have developed incentive schemes for automakers to further push their electrification rates. In this specific case, regulatory credits stand-out as the most popular policy adopted, with governments imposing penalties to all automakers that do not comply **with a pre-determined minimum number of credits per year**¹⁹. Such credits are obtained every time an automaker develops and sells electric vehicles. So, since NIO is already a 100% electrified manufacturer, the company has more credits in its possession than required by the policy. Therefore, any credits leftover are sold to other manufacturers who need these for accountability reasons, such as Toyota

¹⁸ Source: NIO. 2021. *NIO Launches First Autonomous Driving Model ET7*. <https://www.nio.com/news/nio-launches-first-autonomous-driving-model-et7>

¹⁹ Kharpal, Arjun. CNBC. 2021. *What 'regulatory credits' are — and why they're so important to Tesla*. <https://www.cnbc.com/2021/05/18/tesla-electric-vehicle-regulatory-credits-explained.html>

for instance, who has registered an electrification rate of only 0.2% in 2021. Most importantly, since these credits are given for free by the Chinese government, translate on **100% profit margin sales**, therefore a determinant factor in recent quarterly earnings.

Exhibit 19: Revenue breakdown forecast until 2040 (billion \$)

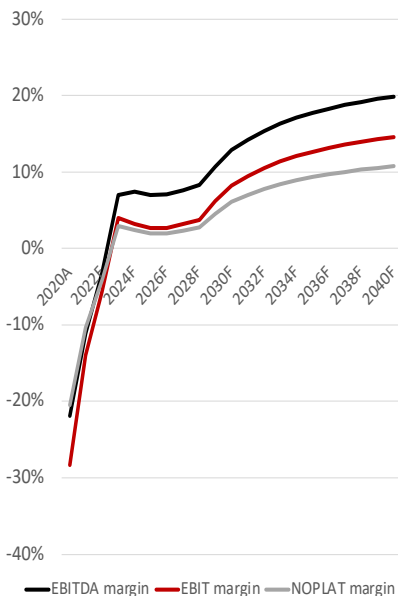


▪ Sum-up

Other Sales caption was forecasted based on the percentage we expect NIO Power, and more specifically, BaaS sales, will represent in this revenue category. We estimate **BaaS to reach 75% by 2030 and 95% by 2040** of the overall revenue of *Other Sales*, given the huge potential this model has to give, in our view. Although NIO’s Autonomous Driving-as-a-Service also has some potential ahead, we didn’t account for it in our forecast model given the fact it hasn’t been marketed yet, thus its success is still uncertain.

This means *Other Sales* will amount to **\$11 billion** (71 billion RMB) in 2030 and **\$40 billion** (257 billion RMB) in 2040, according to our forecasts. The big take one can conclude is the fact NIO’s revenue model will steadily become more dependent on BaaS subscriptions throughout the next two decades. Such dependency is reflected by the following numbers: BaaS to represent 16.2% of the total **51 billion USD** (332 billion RMB) revenues in 2030 and 32.3% of the total **104 billion USD** (673 billion RMB) revenues in 2040.

Exhibit 20: EBITDA, EBIT and NOPLAT margins forecasts until 2040



Profitability Forecast

For many years, OEMs have been very skeptical in regards to the potential profitability of the EV business. However, such beliefs are about to change, with companies like Tesla having registered gross margins of 30% in recent quarters and automaker giants like Ford and VW making recent bullish statements saying electric vehicles will be as profitable as ICEs vehicles by 2025²⁰.

In our model, three main profitability drivers were considered to explain NIO’s 2022-2040 profitability outlook: 1) **falling battery costs**; 2) **mass-production**, and 3) **vertical integration**. With these combined, we estimate the automaker’s EBIT margins to reach 8.1% by 2030 and 14.4% by 2040, while NOPLAT’s ones are expected to boost up to 6.0% by 2030 and 10.7% by 2040.

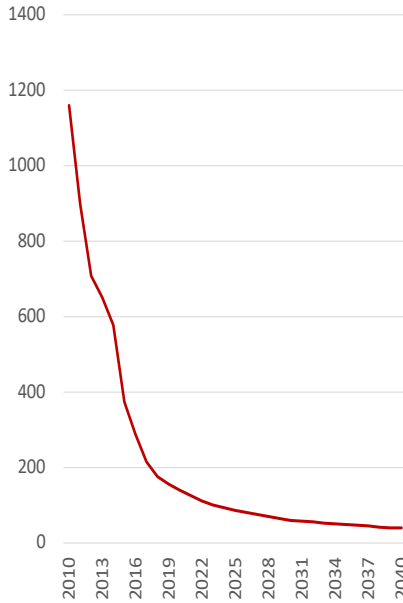
▪ Falling battery costs

Since 2010, battery prices have been decreasing at an astonishing pace of 19.1% (CAGR 2010 - 2020), from \$1160/kWh in 2010 to \$140/kWh in 2020 and expected

²⁰ Source: Automotive News Europe. 2021. *Automakers finally see EV profit potential*. <https://europe.autonews.com/automakers/automakers-finally-see-ev-profit-potential>

to fall below \$100/kWh by 2023, \$60/kWh by 2030, and \$39/kWh by 2040. Such decrease is mainly explained by the development of more advanced battery packs as well as new cathode chemistries applied in manufacturing. Furthermore, according to a report from the *World Electric Vehicle Journal*²¹, batteries are predicted to account for just 25% of the **total direct costs of an EV in 2030, and only 22% in 2040**, which represents a huge decrease from the initial 40% in 2020. At this level, and assuming no government subsidies will be available, the cost to manufacture an electric vehicle should be as close as an internal combustion one by mid-decade.

Exhibit 21: Volume weighted average price of battery packs (USD per kWh)



▪ **Mass-production**

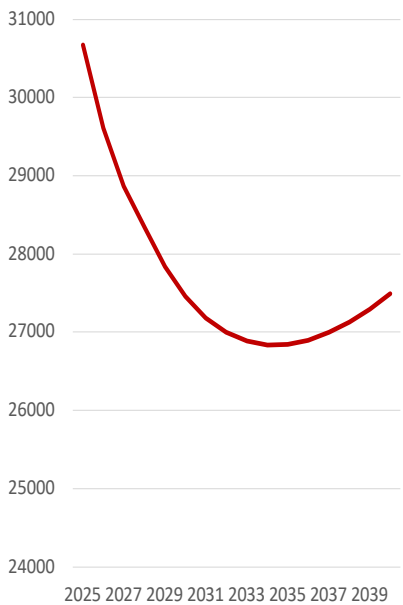
NIO’s strong investment in NeoPark, a 17-acre mega industrial facility with a production capacity of over 1 million vehicles and 100 GWh of battery per year, will allow the automaker to benefit from boosted economies of scale by not only spreading out fixed costs through more units produced but also providing NIO more bargaining power to negotiate lower variable costs with its suppliers.

To account for such benefits from an increased scale of production, we applied Wright’s Law, a reliable framework in many industries, developed by Theodore Wright in 1936, for forecasting cost declines as a function of cumulative production levels. According to the latter, for every cumulative doubling of production, manufacturing costs should reduce by roughly 15% in the auto-industry²². Given this, we estimate NIO’s manufacturing costs to decline constantly from \$40,198 per vehicle in 2022, when cumulative deliveries amount to 300,000 EVs, down to the minimum efficient scale (**MES**) **point of \$27,385 per vehicle in 2035**, when cumulative deliveries amount **12.8 million EVs**. From that point onwards, NIO should suffer from light diseconomies of scale, with an estimated \$28,044 cost per vehicle in 2040 being determined when cumulative deliveries reach 20.7 million EVs. This translates into estimated vehicle gross margins of 24.2% in 2030 and 30.3% in 2040.

▪ **Vertical Integration**

One of the main advantages of the NeoPark besides its size is the ability to provide NIO access to an almost 100% vertical integrated manufacturing process, meaning the automaker will be able to produce most of its EV components rather than outsourcing it from suppliers. For instance, according to recent quarterly reports, the **NeoPark will have a battery factory added to the vehicle one**, which means

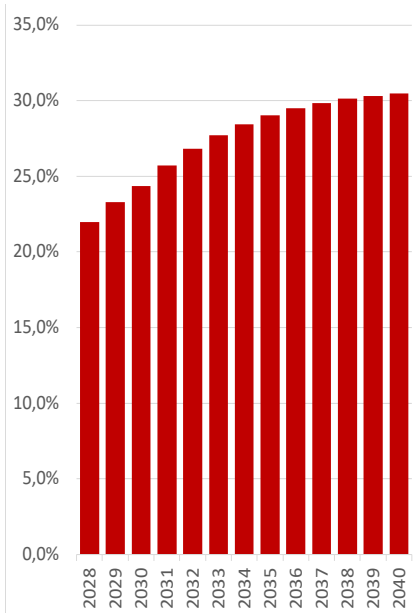
Exhibit 22: Vehicle unit forecast and minimum efficiency scale point (\$)



²¹ Source: MDPI. 2021. *An Overview of Parameter and Cost for Battery Electric Vehicles*. <https://www.mdpi.com/2032-6653/12/1/21>

²² Source: Korus, Sam. Ark Invest. 2021. *Wright’s Law Predicted 109 Years of Auto Production Costs, and Now Tesla’s*. <https://ark-invest.com/articles/analyst-research/wrights-law-predicts-teslas-gross-margin/>

Exhibit 23: Vehicle margin forecast until 2040



NIO will be able not only to produce battery-packs themselves but also to ship them directly to the vehicle factory in a very short distance, thus saving up significant logistic costs. Additionally, vertical integration will enable NIO to have more control over the supply chain as well as the ability to push towards technological innovation in each production stage, which will optimize the operational efficiency of the manufacturing process as a whole. For instance, by not depending on battery suppliers such as CATL, NIO could redesign batteries to fit each EV model pack in a particular way in order to reduce costs and boost charging efficiency.

Valuation

Discounted Cash-Flow

Given the high unpredictability regarding the company’s cash flows and more importantly the company’s future levels of debt, it was quite hard to determine the financial valuation via the APV. Therefore, we proceeded with the DCF methodology, assuming no major capital structure changes would occur.

- WACC

Let’s start with the first component of the weighted average cost of capital, the cost of equity. First, for the beta computation, a 3-year regression between NIO’s stock and the SPY index daily returns was made. Although the most recommended regression approach is involving monthly window returns, NIO’s stock just started trading, back in 2018, which means we lacked monthly data and therefore the best option available was using daily returns. We obtained a **levered beta of 1,10**, which indicates NIO’s stock has a higher risk profile compared to the market volatility. Given the expected target capital structure of 38,7%, an unlevered beta of 0,92, and a corporate tax rate of 26,17%, a relevered equity beta of 1,19 was obtained, which then was readjusted back to 1,12 using the Blume adjustment method. Finally, using both market risk premium and risk-free rate proxies of 4,72% and 1,93%, respectively, a **cost of equity of 6,65%** was computed, through the CAPM.

Exhibit 24: WACC

Risk-free rate	1,93%
Market risk premium	4,72%
Levered Beta	1,10
Debt	8 471 379
Equity	31 862 243
D/E	26,59%
tax rate	26,17%
Unlevered Beta	0,92
Target D/E	38,7%
Relevered Beta	1,19
Ajusted Levered Beta	1,00
Return on equity	6,65%
Cost of debt	3,27%
WACC	5,30%

To determine the company’s cost of debt, we estimated the expected return of one of the company’s outstanding bonds maturing in 2027²³. This bond has a YTM of 5,39% and given the fact NIO does not have a credit rating yet, we decided to set a conservative S&P Global rating of B, which is quite suitable for the level of risk of a high-growth firm we are considering, corresponding to a probability of default

²³ Source: <https://www.bondsupermart.com/bsm/bond-factsheet/USG6525FAA06>

Exhibit 25: NIO's price per share

RMB thousand	FCF	PV FCF
2023	10 836 625	9 282 088
2024	3 705 528	3 014 294
2025	2 248 674	1 737 184
2026	1 286 412	943 807
2027	1 117 471	778 616
2028	1 134 828	750 933
2029	5 175 362	3 252 338
2030	9 558 300	5 704 524
2031	13 483 510	7 642 327
2032	17 121 189	9 215 956
2033	20 721 104	10 592 617
2034	24 192 966	11 745 280
2035	27 474 930	12 667 611
2036	30 528 802	13 367 548
2037	33 334 323	13 861 732
2038	35 883 658	14 171 194
2039	38 176 674	14 318 308
2040	40 217 205	14 324 827
Continuing value	945 289 380	336 699 341
Enterprise value		484 070 524
Net debt		(50 944 935)
Equity value		535 015 459
Number of shares outstanding (000s)		1 613 167
RMB value per share		331,66
1Y Forward rate		5,87
USD Value per share		56,54
WACC		5,30%
Perpetuity growth		1,00%

of 3,52%. Finally, by factoring in the expected loss rate of 60%, we managed to reach a **cost of debt of 3,27%**. One might have thought of a higher return, given the risky background of the Chinese automaker, however, their promising growth and cash-flow generation in the coming years should reflect such low debtholders' rate of return. This means NIO's probability to repay any future debt borrowed will be quite high, which contributes to higher credit ratings associated and higher ability to maintain the target capital structure level in the long-term.

Considering every component estimated above, a final **WACC of 5,30%** was attained.

- Price per share

Each free-cash-flow of the 18-year forecast horizon was discounted considering the above-estimated WACC rate and assuming a perpetuity growth of 1%, which led to an **enterprise value of \$72 billion** (474 million RMB) and an **equity value of \$80 billion** (522 million RMB), given the negative expected 2022 Net Debt of \$7 billion (47 million RMB). Then, considering 1.613.167 shares outstanding, this led us to a BUY recommendation for any potential NIO investor at a target **price per share** of 324.16 RMB or **55.26\$** (Dec-2022 5.87 RMB-\$ forward rate). This corresponds to a bullish upside of 52.6%. The discounted continuation value represents 70% of the total enterprise value (331 million RMB) while the value of operations represents only 30%.

Exhibit 26: Best-case scenario

RMB thousand	FCF	PV FCF
2023	10 836 625	9 282 088
2024	3 705 528	3 014 294
2025	2 248 674	1 737 184
2026	1 286 412	943 807
2027	1 117 471	778 616
2028	1 134 828	750 933
2029	5 175 362	3 252 338
2030	11 855 074	7 075 270
2031	23 939 231	13 568 530
2032	32 712 149	17 608 225
2033	41 753 297	21 344 262
2034	50 763 381	24 644 771
2035	59 507 105	27 436 388
2036	67 814 912	29 693 897
2037	75 576 165	31 427 564
2038	82 727 951	32 670 968
2039	89 242 715	33 470 823
2040	95 116 724	33 879 296
Continuing value	2 235 680 703	796 319 346
Enterprise value		1 088 898 598
Net debt		(50 944 935)
Equity value		1 139 843 533
Number of shares outstanding (000s)		1 613 167
RMB value per share		706,59
1Y Forward rate		5,87
USD Value per share		120,45
WACC		5,30%
Perpetuity growth		1,00%

Scenario Analysis

Valuing high-growth companies can be a tough job, even for the best experts in the business. Uncertainty plays a big role in justifying the latter. One of the best ways to deal with this is by creating different scenarios with weighted probabilities allocated to each one of them. Until now, we have focused on the base-case scenario, where we assumed a 70% chance of happening.

- Best-case Scenario

Let's focus now on the best-case scenario, where a 10% chance was assumed. Here, not only will NIO build two manufacturing plants, but also another one, probably in Europe, giving it an additional 480k units per year to the Chinese manufacturer. This means that, by 2030, around 1.6m units per year will be delivered as opposed to the 1.1m per year in the base-case scenario, which is translated to a slightly above 3,4% EV market share. Such a 0.5m units increase will certainly depend on the state of the global chip shortage, which directly impacts every automaker's production capabilities. From 2030 onwards, the delivery volume is expected to follow the BEV industry growth, which will decelerate from

Exhibit 27: Worst case scenario

RMB thousand	FCF	PV FCF
2023	8 875 285	7 602 106
2024	1 829 121	1 487 914
2025	239 446	184 981
2026	(962 028)	(705 815)
2027	(1 487 137)	(1 036 187)
2028	(1 868 312)	(1 236 290)
2029	1 252 590	787 161
2030	4 636 837	2 767 327
2031	7 979 139	4 522 501
2032	10 210 141	5 495 893
2033	12 242 419	6 258 318
2034	14 088 593	6 839 776
2035	15 760 210	7 266 414
2036	17 268 125	7 561 138
2037	18 622 230	7 743 861
2038	19 831 034	7 831 683
2039	20 901 266	7 839 100
2040	21 837 589	7 778 255
Continuing value	513 283 819	182 824 781
Enterprise value		261 812 918
Net debt		(50 944 935)
Equity value		312 757 851
Number of shares outstanding (000s)		1 613 167
RMB value per share		193,88
1Y Forward rate		5,87
USD Value per share		33,05
WACC		5,30%
Perpetuity growth		1,00%

a higher rate of 15%, in 2031, down to 2% in 2040, meaning NIO will increase its EV market share to 3,5%. This translates to 2.9m sold electric vehicles in 2040, as opposed to the 1.6m in the base case scenario. Regarding the average delivery price, we expect a better-positioned premium sector to help NIO increase its share of premium vehicles sold, which instantly contributes to a higher average delivery price. This will probably be accomplished if higher market penetration is reached in western countries, as European and US consumers' buying-power is much stronger than Chinese ones, which makes it easier to afford a premium vehicle. BaaS cumulative subscriptions will reach 4.5m by 2030 and 25m by 2040, as these are directly related to the number of vehicles delivered. All in all, every factor above mentioned will be reflected in total revenues of 440 billion RMB in 2030 (\$67 billion) and 1,143 billion RMB in 2040 (\$175 billion). These best-case scenario assumptions result in a share price of **695.31 RMB or \$120.45**, meaning an upside of 141%, thus reinforcing our BUY recommendation.

▪ Worst-case Scenario

Let's look now at the worst-case scenario, with a 20% chance of occurring. In this case, NIO will not be able to further expand its production capabilities to Europe, whereas by 2030 only 0.9m vehicles will be produced solely on Chinese ground, through the JAC partnership and the mega industrial city NeoPark. This translates into a 2.1% EV market share captured. Some factors that could justify such a case are the already mentioned chip shortage, which in this case should perpetuate throughout the decade; and the Evergrande default which if it occurs should cause massive ripple effects in China's economy, affecting demand and consequently the Chinese automotive industry. In the long-term, a low growth rate of 4% was assumed, decelerating down to 0.5% by 2040. This translates into 1.1m vehicles delivered in 2040, representing a 1.4% EV market share. At the same time, BaaS cumulative subscriptions should decrease as well as the average delivery price should, given higher mass-market penetration rates, which could be due to higher technological improvements and specifications surrounding low-priced cars that raise user satisfaction rates and consequently, demand. All in all, this reflects into revenues of 288 billion RMB (\$44 billion) by 2030 and 490 billion RMB (\$75 billion) by 2040, resulting in a share price of 187,88 RMB or \$33,05, which represents a downside of 1,03%, thus giving it a SELL recommendation.

Exhibit 28: Sensitivity analysis (1)

		Long term Growth rate				
		0,80%	0,90%	1,00%	1,10%	1,20%
WACC	\$ 56,54					
	5,10%	\$ 56,91	\$ 57,81	\$ 58,76	\$ 59,75	\$ 60,79
	5,20%	\$ 55,21	\$ 56,05	\$ 56,94	\$ 57,86	\$ 58,84
	5,30%	\$ 53,64	\$ 54,43	\$ 55,26	\$ 56,13	\$ 57,04
	5,40%	\$ 52,05	\$ 52,79	\$ 53,57	\$ 54,38	\$ 55,24
	5,50%	\$ 50,58	\$ 51,28	\$ 52,01	\$ 52,77	\$ 53,57

Exhibit 29: Sensitivity analysis (2)

		Long term growth rate				
		0,80%	0,90%	1,0%	1,10%	1,20%
Market Share of 2030	\$ 56,54					
	2,20%	\$ 47,26	\$ 50,41	\$ 53,64	\$ 56,95	\$ 60,33
	2,30%	\$ 47,95	\$ 51,15	\$ 54,43	\$ 57,80	\$ 61,24
	2,40%	\$ 48,66	\$ 51,92	\$ 55,26	\$ 58,68	\$ 62,19
	2,50%	\$ 49,41	\$ 52,73	\$ 56,13	\$ 59,62	\$ 63,18
	2,60%	\$ 50,20	\$ 53,58	\$ 57,04	\$ 60,59	\$ 64,22

All in all, this corresponds to a **share price of \$56.94** if we account for each scenario weight and the share prices derived from it.

Sensitivity Analysis

To analyze the effect of certain independent variables on our dependent one – the share price – two sensitivity analysis were conducted: **1) WACC vs LT growth rate** and **2) 2030 EV market share vs LT growth rate**.

Exhibit 30: Multiples valuation

High-growth peers Multiples Valuation

High-growth peers	EV/Revenue (TTM)
Tesla	22,42x
XPENG	14,55x
Li Auto	7,93x
Average	14,97x

NIO 2021

Revenues 2021	31 660 171
Enterprise value	473 847 223
Net Debt	(50 944 935)
Equity value	524 792 158
Shares Outstanding (000s)	1 613 167
RMB value per share	325,32
1Y Forward rate	5,87
USD Value per share	55,46

Let's look at the impact of both the WACC and perpetuity growth rates. According to the analysis, the higher the WACC rate, the lower the stock price and vice-versa for the perpetuity growth rate. Within the range of 5.10% - 5.50% WACC and 0.8% - 1.2% LT growth, **NIO stock ranges from \$50.58 up to \$60.79, which reinforces our BUY recommendation.**

On the other hand, if we analyze the impact of both the 2030 EV market share and the LT growth rate, we can observe a price range from \$47.26 per share, when a 2.2% EV market share is captured and a 0,8% LT growth is achieved, to **\$64.22 per share, when a 2.6% EV market share is captured, and a 1.2% LT growth is achieved.**

Multiples Analysis

To finalize our valuation, a relative valuation analysis based on selected comparable peers was made. For that, we chose three similar companies, which in our view have the best similarities namely Tesla, XPeng, LiAuto. Although Tesla's size is much higher with a larger geographical footprint, we believe it suits well our peer group as it not only operates in the same industry with an identical business model but also has similar market expectations regarding profitability and growth common to an EV pure player.

We used EV-to-revenues multiple as this is the most indicated for start-up companies within high-growth industries, where profitability indicators are usually negative, due to high R&D and Capex spending in the short-term which depresses earnings. Hence, when taking the EV-to-revenues average of our peer group, which equals 14,97x (Tesla = 22,42x; XPeng = 14,55x; LiAuto = 7,93x), this gives NIO an **enterprise value of 473 billion RMB**, considering the level of revenues of 2021. Such value corresponds to a share price of 323 RMB or **\$55.46**.

Exhibit 31: DCF valuation

DCF Valuation

Base Case Scenario	\$ 56,54
Base Case %	70%
Best Case Scenario	\$ 120,45
Best Case %	10%
Worst Case Scenario	\$ 33,05
Worst Case %	20%
Price per Share	\$ 58,23
DCF %	50%

Multiples Valuation

Price per Share	\$ 55,46
Multiples %	50%

Final Valuation

Price per Share	\$ 56,85
Reccommendation	BUY

Final Recommendation

Although the DCF valuation method usually delivers the most precise results, it is always necessary to compare it with the current market expectations, in order to absorb certain DCF flaws that might have occurred. Therefore, to reach our final NIO stock price we applied an equal-weighted average of the DCF (scenario analyzed one = \$58.23) and Multiples shares prices obtained (\$55.46), giving us a final price of **\$56.85** (upside of 7.03%), meaning that we maintain our **BUY recommendation**.

Financial Statements

Income Statement

RMB thousand	2018A	2019A	2020A	2021E	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F	2031F	2032F	2033F	2034F	2035F	2036F	2037F	2038F	2039F	2040F
Vehicle sales	4,852,470	7,367,113	15,182,522	31,660,171	66,253,250	110,031,039	129,400,620	148,724,504	168,069,016	188,149,308	208,243,820	234,086,914	260,121,051	286,118,195	309,298,550	329,724,916	347,594,700	363,178,309	376,774,320	388,679,817	399,172,675	408,502,454	416,887,034
Other sales	98,701	457,791	1,075,411	2,142,458	4,961,032	9,478,215	15,287,741	22,282,673	30,383,169	39,519,996	49,633,101	60,366,946	71,862,394	86,686,995	102,667,036	119,649,576	137,493,267	156,072,236	175,277,532	195,016,959	215,213,943	235,805,918	256,742,530
Total revenues	4,951,171	7,824,905	16,257,933	33,802,629	71,214,281	119,509,254	144,688,361	171,007,177	198,452,185	227,669,304	257,876,921	294,453,860	331,983,445	372,805,190	411,965,586	449,374,492	485,087,967	519,250,544	552,051,852	583,696,776	614,386,618	644,308,372	673,629,564
Vehicle cost of sales	(4,930,135)	(8,096,035)	(13,255,770)	(25,380,904)	(50,947,368)	(75,580,582)	(92,454,045)	(109,924,163)	(127,325,568)	(144,817,616)	(162,509,920)	(179,581,616)	(196,821,976)	(212,623,761)	(226,427,703)	(238,410,589)	(248,796,601)	(257,824,299)	(265,725,247)	(272,711,765)	(278,971,159)	(284,664,193)	(289,926,089)
Other cost of sales	(276,912)	(927,691)	(1,128,744)	(1,778,240)	(4,104,131)	(7,814,824)	(12,561,775)	(18,245,718)	(24,790,372)	(32,128,671)	(40,201,482)	(48,711,646)	(57,765,114)	(69,408,853)	(81,875,646)	(95,030,424)	(108,748,898)	(122,920,490)	(137,449,268)	(152,253,565)	(167,264,959)	(182,426,588)	(197,691,748)
Total Cost of Sales	(5,207,047)	(9,023,726)	(14,384,514)	(27,159,144)	(55,051,500)	(83,395,406)	(105,015,820)	(128,169,881)	(152,115,940)	(176,946,287)	(202,711,401)	(228,293,262)	(254,587,090)	(282,032,614)	(308,303,348)	(333,441,013)	(357,545,499)	(380,744,789)	(403,174,515)	(424,965,350)	(446,236,118)	(467,090,781)	(487,617,837)
Gross profit	(255,876)	(1,198,822)	1,873,420	6,643,485	16,162,782	36,113,848	39,672,541	42,837,296	46,336,245	50,723,017	55,165,519	66,160,599	77,396,356	90,772,575	103,662,237	115,933,479	127,542,468	138,505,756	148,877,337	158,731,426	168,150,500	177,217,591	186,011,727
Research and development	(3,997,942)	(4,428,580)	(2,487,770)	(4,719,974)	(8,171,046)	(12,052,314)	(12,204,423)	(12,723,690)	(12,977,903)	(13,038,447)	(12,833,020)	(12,759,740)	(12,230,323)	(13,171,071)	(13,878,681)	(14,452,685)	(14,907,676)	(15,257,670)	(15,515,003)	(15,689,922)	(15,790,561)	(15,823,135)	(15,792,217)
Selling, general and administrative	(4,867,567)	(4,452,849)	(2,885,775)	(5,519,974)	(10,002,359)	(15,316,555)	(16,330,758)	(17,748,218)	(18,921,328)	(19,927,749)	(20,680,019)	(21,668,600)	(22,189,826)	(24,386,481)	(26,259,537)	(27,964,943)	(29,498,208)	(30,877,016)	(32,118,827)	(33,239,542)	(34,252,901)	(35,170,341)	(36,001,104)
Other operating loss, net	0	0	(61,023)	(169,013)	(297,765)	(417,874)	(423,071)	(418,149)	(405,797)	(389,309)	(368,756)	(352,112)	(331,983)	(347,840)	(358,673)	(365,005)	(367,628)	(367,166)	(364,218)	(359,308)	(352,872)	(345,276)	(336,815)
EBITDA	(9,121,387)	(10,080,252)	(3,361,145)	(3,765,477)	(2,308,338)	8,327,106	10,714,289	11,947,239	14,051,217	17,367,512	21,303,725	31,380,147	42,644,223	52,887,163	63,165,362	73,150,845	82,768,956	92,003,905	100,879,289	109,442,635	117,734,166	125,878,339	133,881,581
(Less) Depreciation and amortization	474,223	998,938	1,046,496	960,051	1,764,075	3,558,492	6,082,279	7,361,728	8,707,996	10,127,812	11,668,712	13,291,827	15,377,367	17,586,226	19,908,333	22,149,279	24,301,091	26,365,708	28,351,659	30,271,376	32,139,206	33,970,054	35,778,522
EBIT	(9,595,610)	(11,079,190)	(4,607,641)	(4,725,528)	(4,072,463)	4,768,613	4,632,009	4,585,511	5,323,220	7,239,699	9,635,013	18,088,320	27,266,856	35,300,937	43,257,049	51,001,566	58,467,865	65,638,197	72,527,630	79,171,279	85,614,900	91,906,764	98,103,069
(Less) Operating cash taxes	(2,491,291)	(2,757,490)	(1,273,742)	(1,236,448)	(1,065,571)	1,247,721	1,211,978	1,199,812	1,392,835	1,894,287	2,521,028	4,732,659	7,134,448	9,236,593	11,318,327	13,344,701	15,298,279	17,174,416	18,977,056	20,715,385	22,401,392	24,048,188	25,669,940
NOPLAT	(7,104,319)	(8,321,700)	(3,333,902)	(3,489,081)	(3,006,891)	3,520,893	3,420,031	3,385,699	3,930,385	5,345,412	7,113,985	13,355,461	20,132,407	26,064,364	31,938,722	37,656,865	43,169,586	48,463,781	53,550,574	58,455,895	63,213,568	67,860,596	72,434,129
Net income	(9,638,979)	(11,295,652)	(5,304,082)	(5,304,698)	(4,678,100)	4,090,932	3,942,002	3,890,031	4,629,372	6,542,104	8,911,102	17,312,821	26,311,859	34,027,834	41,709,043	49,093,386	56,119,263	62,772,096	69,070,423	75,052,717	80,767,807	86,268,367	91,606,770
(Less)																							
Interest income	133,386	160,280	166,903	209,211	257,885	312,951	374,283	441,604	514,505	592,459	674,845	760,973	850,110	941,503	1,034,401	1,128,075	1,221,835	1,315,041	1,407,110	1,497,526	1,585,843	1,671,681	1,754,726
Interest expenses	(123,643)	(370,536)	(426,015)	(345,209)	(411,590)	(538,988)	(600,905)	(661,785)	(721,867)	(793,615)	(895,271)	(1,033,659)	(1,303,707)	(1,712,929)	(2,080,093)	(2,532,826)	(3,065,302)	(3,673,682)	(4,353,929)	(5,102,214)	(5,915,126)	(6,789,787)	(7,723,887)
Share of losses of equity investee	(9,722)	(64,478)	(66,030)	(66,954)	(68,427)	(70,155)	(71,927)	(73,743)	(75,605)	(77,514)	(79,074)	(80,665)	(82,288)	(83,944)	(85,633)	(87,356)	(89,114)	(90,907)	(92,736)	(94,602)	(96,506)	(98,448)	(100,429)
Other (loss)/income, net	(21,346)	66,160	(364,928)	(370,037)	(378,178)	(387,727)	(397,517)	(407,554)	(417,845)	(428,396)	(437,016)	(445,810)	(454,780)	(463,932)	(473,267)	(482,790)	(492,505)	(502,415)	(512,525)	(522,838)	(533,359)	(544,091)	(555,040)
EBT	(9,616,935)	(11,287,764)	(5,297,714)	(5,298,517)	(4,672,773)	4,084,695	3,935,943	3,884,033	4,622,409	6,532,634	8,898,498	17,289,160	26,276,191	33,981,656	41,652,458	49,026,670	56,042,780	62,686,233	68,975,548	74,949,151	80,655,812	86,148,139	91,478,440
(Plus) Non operating taxes	2,513,335	2,765,378	1,280,110	1,242,629	1,070,898	(1,253,959)	(1,218,037)	(1,205,810)	(1,399,799)	(1,903,758)	(2,533,632)	(4,756,521)	(7,170,117)	(9,282,771)	(11,374,912)	(13,411,417)	(15,374,762)	(17,260,279)	(19,071,930)	(20,818,950)	(22,513,386)	(24,168,416)	(25,797,271)
NOPLAT	(7,104,319)	(8,321,700)	(3,333,902)	(3,489,081)	(3,006,891)	3,520,893	3,420,031	3,385,699	3,930,385	5,345,412	7,113,985	13,355,461	20,132,407	26,064,364	31,938,722	37,656,865	43,169,586	48,463,781	53,550,574	58,455,895	63,213,568	67,860,596	72,434,129
CHECK	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE

Balance Sheet

RMB thousand	2018A	2019A	2020A	2021E	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F	2031F	2032F	2033F	2034F	2035F	2036F	2037F	2038F	2039F	2040F
Working cash	99,023.42	156,498.09	325,159	676,053	1,424,286	2,390,185	2,893,767	3,420,144	3,969,044	4,553,386	5,157,538	5,889,077	6,639,669	7,456,104	8,239,312	9,087,490	9,701,759	10,385,011	11,041,037	11,673,936	12,287,732	12,886,167	13,472,591
Restricted cash	57,012	82,507	78,010	145,666	275,612	415,389	451,658	479,417	499,663	514,812	523,697	537,041	543,788	548,425	544,276	533,199	516,921	496,940	474,493	450,567	425,929	401,155	376,671
Trade receivables	844,574	1,402,876	1,293,208	2,881,860	6,507,420	11,704,763	15,188,470	19,240,401	23,931,780	29,426,794	35,724,841	43,721,437	52,833,934	63,591,318	75,317,547	88,056,819	101,881,288	116,888,083	133,196,403	150,945,188	170,291,541	191,409,924	214,492,033
Inventories	1,465,239	889,528	1,081,553	2,607,893	5,637,584	9,707,651	12,059,599	14,625,148	17,415,200	20,500,466	23,826,398	27,915,784	32,295,028	37,212,415	42,194,273	47,226,705	52,310,202	57,455,223	62,678,571	68,000,667	73,443,657	79,030,182	84,782,654
Other operating current assets	1,490,936	1,505,987	1,376,512	1,489,923	1,609,376	1,734,937	1,866,653	2,004,558	2,148,668	2,298,984	2,465,490	2,618,155	2,786,931	2,961,756	3,142,551	3,329,223	3,521,665	3,719,796	3,923,363	4,132,339	4,346,526	4,566,756	4,799,890
(Less) Accounts payable	3,089,536	3,421,428	6,712,856	14,624,712	28,564,633	44,441,407	49,882,081	54,657,532	58,885,273	62,544,565	65,678,357	69,256,428	72,673,428	75,659,920	77,512,112	78,386,588	78,447,400	77,850,197	76,733,912	75,217,589	73,400,434	71,353,372	69,171,539
(Less) Accrued wages	402,163	344,922	494,726	1,056,448	2,285,932	3,939,998	4,899,215	5,947,105	7,088,356	8,352,038	9,716,254	11,394,677	13,194,701	15,218,206	17,271,928	19,350,254	21,453,449	23,585,873	25,754,507	27,967,848	30,235,132	32,565,839	34,969,386
(Less) Taxes Payables days	51,317	43,896	181,658	373,740	779,143	1,293,845	1,550,046	1,812,825	2,081,747	2,363,236	2,648,778	2,992,821	3,338,954	3,710,278	4,057,102	4,379,191	4,677,744	4,954,769	5,212,629	5,453,744	5,680,410	5,894,707	6,098,458
(Less) Other operating current liabilities	2,716,615	3,207,136	3,647,483	7,520,250	15,710,963	26,145,149	31,388,970	36,788,468	42,335,738	48,162,566	54,096,791	61,253,396	68,483,072	76,261,026	83,567,136	90,393,434	96,761,560	102,710,113	108,285,426	113,535,407	118,505,815	123,238,265	127,769,393
Working Capital	(2,302,847)	(2,980,078)	(6,882,281)	(15,773,756)	(31,886,383)	(49,867,476)	(55,260,166)	(59,436,263)	(62,346,758)	(64,127,962)	(64,452,216)	(64,485,123)	(62,590,804)	(59,679,411)	(52,970,321)	(44,376,031)	(33,408,317)	(20,155,940)	(4,672,605)	13,028,099	32,973,593	55,231,001	76,905,024
Net PP&E	4,853,157	5,533,064	4,996,228	9,036,177	17,941,284	30,183,779	35,958,936	41,866,348	47,927,225	54,351,223	60,938,379	69,391,773	78,112,119	87,036,310	95,311,423	102,927,378	109,916,873	116,338,429	122,263,454	127,767,216	132,923,057	137,799,062	142,456,429
Land use rights	213,662	208,815	203,968	174,035	148,496	126,704	108,110	92,244	78,708	67,157	57,302	48,893	41,718	35,595	30,372	25,915	22,112	18,867	16,098	13,736	11,720	10,000	10,000
Net operating leases	0	(209,447)	(212,109)	(441,382)	(930,684)	(1,563,173)	(1,894,130)	(2,240,583)	(2,602,395)	(2,988,082)	(3,387,436)	(3,871,208)	(4,368,338)	(4,909,671)	(5,430,027)	(5,928,162)	(6,404,759)	(6,861,670)	(7,301,353)	(7,726,475)	(8,139,663)	(8,543,367)	(8,939,785)
Net Intangible Assets	3,470	1,522	613	648	686	726	768	812	859	909	962	1,017	1,076	1,139	1,205	1,274	1,348	1,426	1,509	1,596	1,689	1,786	1,890
Long-term restricted cash	33,528	44,523	41,547	41,642	41,728	41,805	41,875	41,937	41,994	42,044	42,090	42,131	42,167	42,200	42,230	42,257	42,281	42,302	42,322	42,339	42,355	42,369	42,381
Amounts due from related parties	7,970	0	617	561	509	463	421	382	347	316	287	261	237	215	196	178	161	147	133	121	110	100	100
Other operating non-current assets	734,018	675,301	1,303,480	2,806,442	6,122,649	10,639,972	13,339,488	16,326,254	19,619,807	23,308,266	27,339,125	32,326,302	37,741,733	43,888,829	50,222,650	56,730,125	63,415,069	70,293,564	77,300,468	84,734,287	92,359,223	100,299,539	108,590,777
(Less) Other operating non-current liabilities	800,817	1,001,187	1,709,181	3,593,776	7,656,766	12,994,442	15,909,902	19,016,301	22,317,492	25,892,369	29,659,074	34,248,391	39,049,650	44,346,614	49,558,398	54,669,178	59,680,497	64,605,083	69,462,019	74,273,284	79,061,469	83,848,386	88,654,315
Invested Capital	2,742,141	2,272,515	(2,257,118)	(7,749,408)	(16,218,491)	(23,431,642)	(23,814,501)	(22,365,169)	(19,597,706)	(15,238,398)	(9,120,683)	(795,345)	9,300,258	22,668,593	37,649,329	54,753,756	73,904,271	95,072,042	118,277,586	143,587,835	171,110,813	200,982,102	233,412,501
Excess cash	3,034,824	706,341	38,100,382	37,149,707	54,107,164	67,056,082	71,055,188	73,385,337	74,770,151	76,629,376	79,716,474	84,000,259	109,634,749	128,310,726	149,055,248	174,925,304	205,622,918	240,838,696	280,220,373	323,399,779	370,009,738	419,693,965	481,275,597
Investments	6,005,139	1,377,395	4,490,358	5,628,625	6,938,146	8,419,645	10,069,702	11,880,915	13,842,241	15,939,590	18,156,020	20,473,217	22,871,364	25,330,198	27,829,525	30,349,741	32,872,259	35,379,848	37,856,872	40,289,447	42,665,523	44,974,893	47,209,154
Total funds invested	11,782,104	4,356,251	40,333,622	35,028,924	44,826,820	52,044,086	57,510,290	62,901,082	69,014,686	77,330,387	88,751,911	109,478,131	142,436,371	176,309,517	214,534,102	260,028,802	312,399,449	371,290,526	436,354,830	507,276,862	583,765,874	665,660,960	761,897,253
Short-term debt	1,870,000	885,620	1,550,000	1,550,000	1,848,056	2,420,078	2,698,088	2,971,441	3,241,209	3,563,361	4,019,799	4,641,167	5,853,694	7,691,116	9,339,694	11,372,483	13,763,319	16,494,971	19,549,307	22,909,132	26,559,138	30,486,397	34,680,542
Long-term debt	1,366,864	7,477,234	6,318,839	6,318,839	7,533,914	9,865,860	10,999,215	12,113,584	13,213,342	14,526,649	16,387,395	18,920,509	23,863,579	31,354,142	38,074,853	46,361,864	56,108,514	67,244,557	79,696,079	93,992,980	108,272,850	124,282,989	141,381,135
Finance leases and other debt equivalents	394,898	815,209	602,540	602,540	718,405	940,770	1,048,843	1,155,104	1,259,973	1,385,205	1,562,638	1,804,186	2,275,538	2,989,810	3,630,670	4,420,888	5,350,290	6,412,180	7,599,509	8,905,593	10,324,479	11,851,144	13,481,557
Debt and debt equivalents	3,631,762	9,178,063	8,471,379	8,471,379	10,100,375	13,226,709	14,746,146	16,240,129	17,714,924	19,475,215	21,969,833	25,365,863	31,992,811	42,035,067	51,045,217	62,155,235	75,222,123	90,151,708	106,844,895	125,207,704	145,156,468	166,620,531	189,543,233
Shareholders equity	6,821,145	(6,277,599)	27,170,956	21,866,258	30,035,158	34,126,090	38,068,093	41,958,123	46,587,496	53,129,600	62,040,701	79,353,522	105,665,381	129,484,865	158,681,196	193,046,566	232,330,050	276,270,517	324,619,813	377,156,715	433,694,179	494,082,036	567,367,453
Mezzanine equity	1,329,197	1,455,787	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287	4,691,287
Equity and equity equivalents	8,150,342	(4,821,812)	31,862,243	26,557,545	34,726,445	38,817,377	42,759,380	46,649,410	51,278,783	57,820,887	66,731,988	84,044,809	110,356,668	134,176,152	163,372,483	197,737,853	237,021,337	280,961,804	329,311,100	381,848,002	438,385,466	498,773,323	572,058,740
Total funds invested	11,782,104	4,356,251	40,333,622	35,028,924	44,826,820	52,044,086	57,505,525	62,889,540	68,993,307	77,296,101	88,701,821	109,410,673	142,349,479	176,211,220	214,417,699	259,893,087	312,243,480	371,113,512	436,155,995	507,055,706	583,541,935	665,395,854	761,601,973
CHECK	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE

Cash-flow Statement

RMB thousand	2019A	2020A	2021E	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F	2031F	2032F	2033F	2034F	2035F	2036F	2037F	2038F	2039F	2040F
NOPLAT	(8,321,700)	(3,333,902)	(3,489,081)	(3,006,891)	3,520,893	3,420,031	3,385,699	3,930,385	5,345,412	7,113,985	13,355,461	20,132,407	26,064,364	31,938,722	37,656,865	43,169,586	48,463,781	53,550,574	58,455,895	63,213,568	67,860,596	72,434,129
Depreciation and amortization	998,938	1,046,496	960,051	1,764,075	3,558,492	6,082,279	7,361,728	8,707,996	10,127,812	11,668,712	13,291,827	15,377,367	17,586,226									

Disclosures and Disclaimers

Report Recommendations

Buy	Expected total return (including expected capital gains and expected dividend yield) of more than 10% over a 12-month period.
Hold	Expected total return (including expected capital gains and expected dividend yield) between 0% and 10% over a 12-month period.
Sell	Expected negative total return (including expected capital gains and expected dividend yield) over a 12-month period.

This report was prepared by Joaquim Pocinho and André Oliveira, Master's in Finance student of Nova School of Business and Economics ("Nova SBE"), within the context of the Field Lab – Equity Research.

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