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# The Impact of Artificial Intelligence (AI) on the Financial Job Market

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# The Impact of Artificial Intelligence (AI) on the Financial Job Market

## Foreword

In March 2017, Premier Li Keqiang delivered the State Council's 2017 government work report, in which he raised the promotion of emerging industries including artificial intelligence (AI), and "AI" was written into the national government work report for the first time. In July, the State Council issued the "New Generation AI Development Plan", raising AI to a national strategic level. It stated that by 2030, China's AI theory, technology and applications will reach an advanced global level. China has achieved remarkable results in becoming a leading global AI innovation center, a smart economy and a smart society. As Baidu, Alibaba and Tencent (BAT) have entered the AI industry, it has seen an injection of capital and an entrepreneurial boom. AI has become a focus of attention in China's political, economic and academic fields. In 2017, AI in China started a new chapter.

The transformative impact of AI on all industries is indisputable, as is its effect on the labor market. Since the first industrial revolution in the early 19th century, not only has technology largely replaced manual labor, leading to changes in the employment structure and nature of work worldwide, but it has also created new job opportunities. So will AI benefit the labor market in the next decade and beyond, or will it change the labor market and replace us?

This report looks at the prospects of AI applications by examining the status quo and future trends of AI technology. It focuses on analyzing the use cases of AI technology in the financial industry and the impact of these technologies on employment. It will concentrate on the banking, insurance and capital markets<sup>1</sup> as three major industry value chains to measure the possible impact of AI on the job market in these industries. Finally, it will discuss the changes in employment demand and talent requirements in the AI era.

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<sup>1</sup> Capital markets in this report refer to institutional client businesses in the securities industry.

## Summary

The continuous interaction and integration of data, algorithms and use cases are driving AI development. AI has cut positions, broken the bottleneck of human efficiency, reduced standardized and repetitive work, changed the nature of work, and enhanced work efficiency. At the same time, it has also created new jobs.

AI technology will change the business world in three aspects: **automation, intelligence and creation. It will increase automation, support intelligent analysis and decision-making, and create new business models and industries.** In the financial sector, it will make some jobs redundant, while at the same time **increasing efficiency and creating jobs. Based on analysis of the three major value chains in the financial services sector — banking, insurance and capital markets,** this report will examine the potential impact of AI technology on each industry, its jobs and activities, and further estimate the impact on overall employment in the financial industry.

We interviewed experts in financial services and AI, referencing and optimizing industry-accepted analytical frameworks and methodologies, and established the **BCG Model for the Impact of AI in the Financial Job Market by 2027.** According to the model, about 23% of China's financial sector jobs will be disrupted by AI before 2027.<sup>2</sup> This will be reflected in job cuts or the creation of new types of jobs. The job cuts in the banking, insurance and capital markets will be 22%, 25% and 16%. The working hours of the remaining 77% of jobs will be reduced by<sup>3</sup> about 27% due to AI, **equivalent to an increase in efficiency of<sup>4</sup> 38%.** Specifically, the increase in efficiency will be up to 56% in the capital market, around 42% in the banking market and 29% in the insurance market. AI will also create employment demand in the financial industry. It will also retain employees who are more creative, better communicators and able to solve complex problems.

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<sup>2</sup> If a functional activity making up for more than two-thirds of the working time (including core functions of the position) will be replaced by existing AI technology by 2027, this constitutes being disrupted by AI; the estimate of job cuts is based on the status of AI in 2017, and is calculated based on the compound growth rate of employment from 2003-2014 in the banking, insurance and capital markets, and the reduction in the number of positions based on the number of employees in 2027.

<sup>3</sup> Reduced working hours refers to activities that could be carried out using existing AI technologies in positions that have not been replaced by AI by 2027 (where less than two-thirds of working hours have been replaced by AI); the estimate of reduced working hours is based on the status of AI in 2017, and is calculated based on the compound growth rate of employment from 2003-2014 in the banking, insurance and capital markets, and the reduction in the total number of working hours of the total number of employees in 2027.

<sup>4</sup> The increase in efficiency refers to the increased efficiency from the reduction in working hours after applying AI.

# 1. Opportunities and Challenges from the New Wave of AI

## 1.1 Ten Technical Elements Leading AI into a New Age

“AI” is not a new concept, in fact, it was proposed more than 60 years ago. In recent years, the continuous interaction and integration of data, AI algorithms and use cases have driven a new round of AI development. AI is no longer limited to simulating human behavior; it now includes rapid processing and self-learning capabilities.

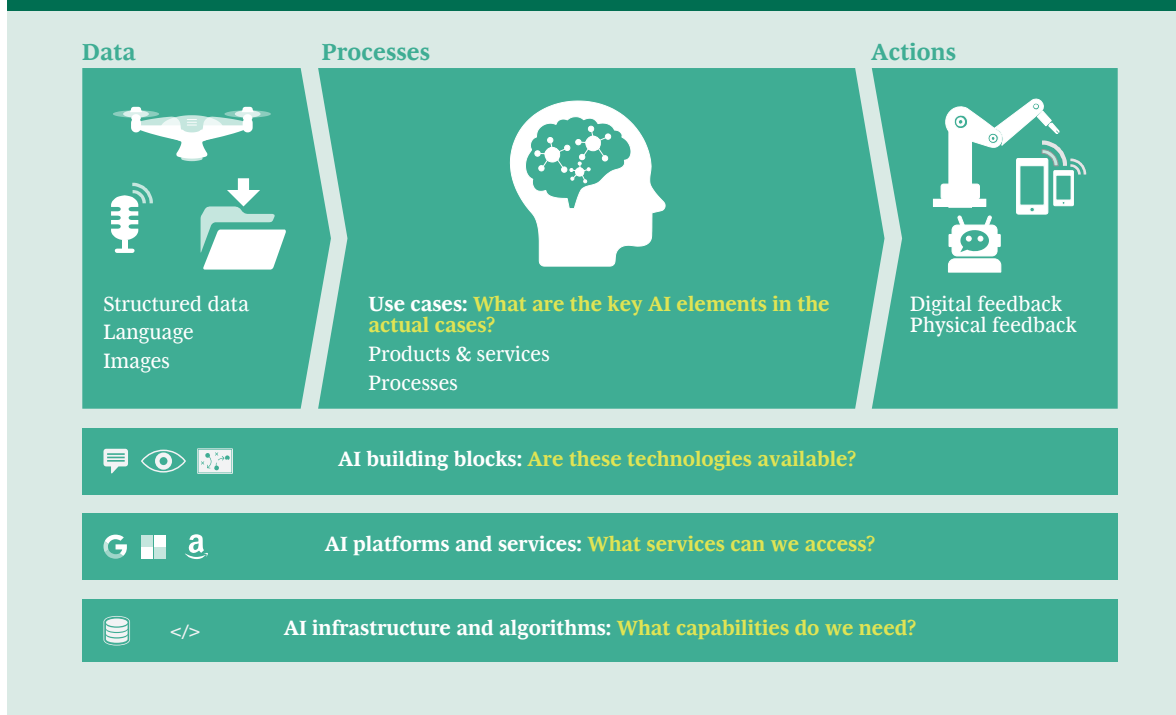
The intent of the AI applications in this report is using computer-controlled systems to sense the environment that the device is placed in, pursue goals, adapt to change, and then provide information or take a particular action. This category includes **machine learning** (i.e. learning algorithms based on data), two major sub-sectors of **robotics**, and non-AI technical upgrades due to the application of AI. The ten key building blocks that support the widespread uses of AI in the real world are machine vision, speech recognition, natural- language processing (NLP), information processing, learning from data, planning and exploring agents, speech generation, image generation, handling and control as well as navigation and movement.

According to research from the BCG Henderson Institute, language and vision have been the two major breakthroughs in AI so far. Machine vision and speech recognition give machines cognitive skills, allowing AI to be applied to real-world applications, which will change all aspects of society in the future. For example, in terms of employment, AI can reduce employee numbers, reduce bottlenecks in efficiency, and reduce standard and repetitive work. It also changes the nature of work, thereby increasing efficiency, and also generating new business models and industries which will create new positions and careers.

## 1.2 Three Dimensions of AI: Data, Processes and Actions

A study by the BCG Henderson Institute revealed that industry users understand AI from three dimensions: data, processes, and actions. AI improves workflows by processing structured data and unstructured language and image information to deliver new products and services, and providing data or physical feedback. (See Exhibit 1.) The ten key AI technologies mentioned above enable this series of actions: machine vision, speech recognition and NLP technology are used to acquire and collect information; information

### Exhibit 1. Understanding AI from the Perspective of Its Users: Data, Processes, and Actions



processing, learning from, planning and exploring agents help with optimization, and image generation, speech generation, handling and control, and navigation and movement provide feedback to the outside world.

### 1.3 Potential Risks of AI

While AI can promote social progress, it carries with it a series of risks. As the scope of AI applications in the financial industry have expanded, the potential risks associated with the research and its implications for regulation have become important topics. In its article “Artificial Intelligence and Machine Learning in Financial Services - Market Developments and Financial Stability Implications”, published in November 2017, the Financial Stability Board (FSB)<sup>5</sup> divided the potential risks of AI in the financial industry into two categories: micro-financial risk and macro-financial risk.

<sup>5</sup> Financial Stability Board (2017): Artificial intelligence and machine learning in financial services: Market developments and financial stability implications.

## 1) Micro-financial risk

- **Financial market risk**

Stability in the financial markets is at risk when a large number of market participants apply AI technology at the same time. For example, if machine learning-based traders outperform other traders, more traders may adopt similar machine learning strategies, thereby increasing the financial turmoil. In addition, predictable patterns in machine learning trading strategies may be vulnerable to manipulation of market prices by criminals.

- **Risks for financial institutions**

For most people, the AI decision-making process is like a “black box”. The lack of transparency makes it difficult for regulators and investors to judge potential problems in the process. If decisions made by AI lead to market losses, it may be difficult to delineate the responsibility. In particular, when there is any uncertainty about the governance structure of AI applications in financial institutions, the risk may be underestimated. If AI is highly dependent on a small number of third-party technology providers, it may pose risks for financial institutions.

- **Risks to consumer privacy**

Machine learning from data is the engine behind AI. It allows a model to be continually improved by collecting, counting and analyzing data, therefore the amount of personal data that is recorded and analyzed is increasing. Such data is at risk from disclosures and abuse of personal information following a hacker attack. For example, data collected or calculated by AI models may lead to prejudice or bias in the results. Policies to protect consumer privacy and data security are therefore essential.

## 2) Macro financial risk

- **Risk of market concentration**

If AI technologies are concentrated in the hands of a small number of leading third-party providers, certain functions in the financial system will become concentrated. In addition, if certain financial institutions control huge quantities of big data, or only large companies can afford the most cutting-edge technologies due to the high R&D costs, their market position may increase, leading to greater market concentration.

- **Risk of market loopholes**

Machine learning trading algorithms involve a certain degree of unpredictability. If they impact the financial markets, it may be more difficult to explain the causes. In addition, if AI is used widely in high-frequency trading, there may be a large volume of transactions at the same time, leading to increased market volatility. The application of AI may also reduce liquidity cushioning, increase leveraging, and lead to potential risk.

- **Connection risks**

The segments of the financial system are mutually connected. If many financial institutions are relying on the same data or algorithms from a particular segment, then when problems occur, they may spread to the entire market. Therefore, collective adoption of AI tools creates a connection risk.

- **Technological risks**

If the AI model is not properly trained or there is not enough feedback, for example, if there is not enough stress testing, users may not be able to detect potential technical risks in time, especially if they don't fully understand the nature and limitations of AI.



## 2. Rebuilding the Financial Industry Value Chain: Automation, Intelligence and Innovation

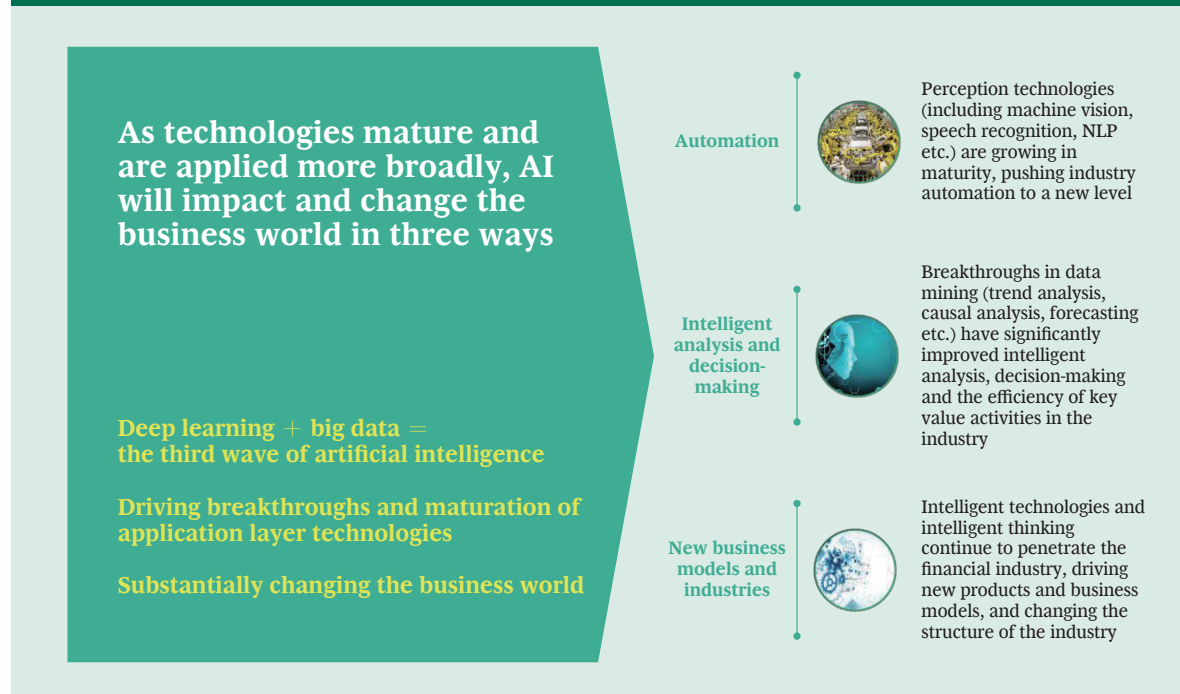
### 2.1 Three Aspects of the Business World that Will Be Impacted by AI

Deep learning and the spread of big data have stimulated the third wave of AI, which has driven breakthroughs in a number of application-layer technologies, fundamentally changing the business world in three aspects: increasing automation, supporting intelligent analysis and decision-making, and creating new business models and industries. (See Exhibit 2.)

- **Increasing automation:** perception technologies (including machine vision, speech recognition, NLP, etc.) are growing in maturity, pushing industry automation to a new level.

The classic use cases in the business world for the high level of automation made possible by AI include customer service chat robots and automatic machine identification. Customer service chat robots are able to follow a standard customer journey,

**Exhibit 2. The Impact of AI on Business World**



analyze conversations with machine learning algorithms and understand the customer's intention. When they encounter a problem, they can send questions to manual representatives, and learn from their answers to improve customer service and reduce service costs. Automatic machine identification is the use of voice recognition or facial recognition for authentication, by analyzing the user's voice, eye and facial features in order to verify their identity, replacing security questions or passwords. This is much faster than asking the user verification questions, and it improves the customer experience because the customer does not need to remember a password.

- **Intelligent analysis and decision making: breakthroughs in data analysis can dramatically improve intelligent analysis and decision-making to increase business value.**

Data analysis includes trend analysis, root cause analysis, data mining, prediction, recommendation and personalization. Compared with business intelligence and traditional analysis, AI is capable of broader and deeper analysis. In the past, business intelligence and traditional analysis were limited to trend analysis, causality analysis, data mining and prediction, whereas AI can continue to learn and improve, offering more relevant suggestions and “personalized analysis”. In this way, AI can provide truly intelligent analysis and decision-making for risk management, marketing, services and other areas. For example, AI enables social network-based credit scoring, optimization of existing scores, or scoring for people with no credit score. It can generate analysis reports using NLP, analyze and evaluate financial data. It is capable of dynamic cheating pattern detection: identifying fraud from complex real-time transactions. It can provide personalized health advice based on customer behavior and research, or offer unique personalized products and marketing based on the customer and product DNA.

- **New business models and industries: smart technologies and smart thinking continue to penetrate the financial industry, driving new products and new business models, and changing the structure of the industry.**

Jinri Toutiao is a typical example of a new business model in the new media era, mining users using AI. This new media platform with tens of millions of DAU launched in 2012, delivers accurate content distribution through AI, enabling AI smart content learning, content creation and user analysis. Jinri Toutiao uses machine learning and data mining to analyze news topics and content, create hot news stories using automated writing technology (such as time-sensitive hot topics like the Olympic Games). It automatically distributes personalized content to every

user, and keeps track of user behavior and habits (including click data, likes/dislikes, subscriptions) to enable smart user analytics.

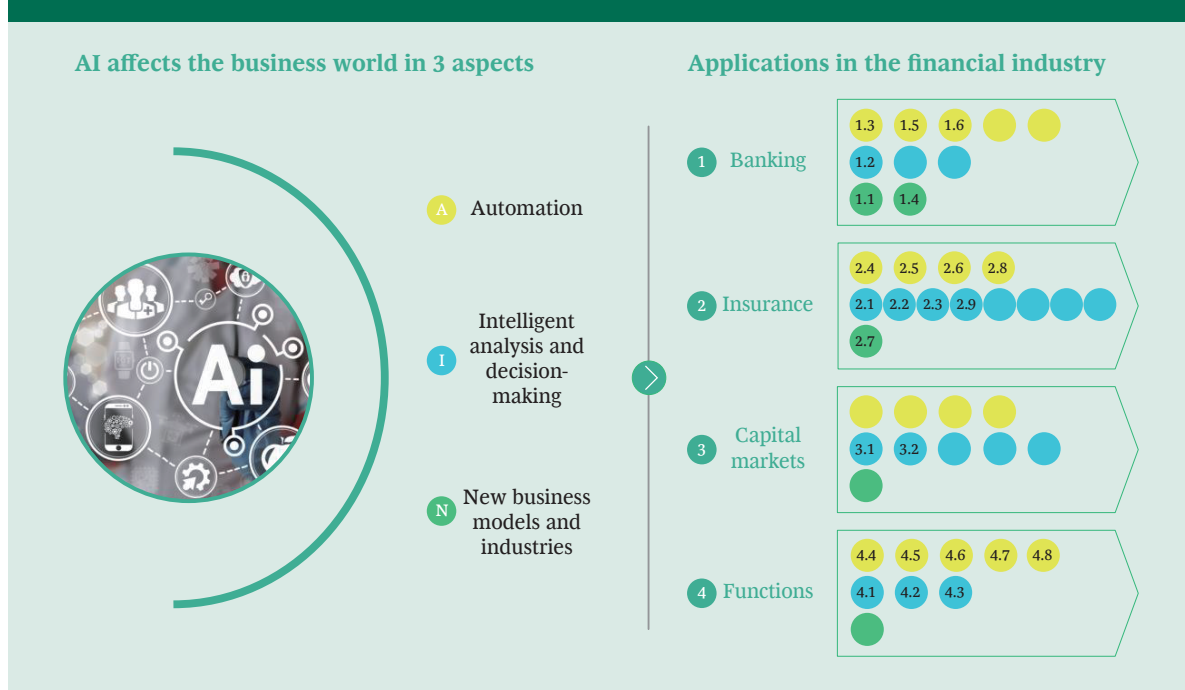
## 2.2 Applications of AI Across the Segments of the Financial Sector

As AI technology has developed, it has been applied widely to the financial industry, and has gradually matured. It has driven profound changes in banking, insurance and capital markets. We worked with industry experts in banking, insurance and capital markets to identify the use cases of AI technologies in different value chains, and analyzed how AI is driving automation, smart analysis, decision making, uncovering new models and new products. We have provided examples of important types of AI applications in various industries. (See Exhibit 3.)

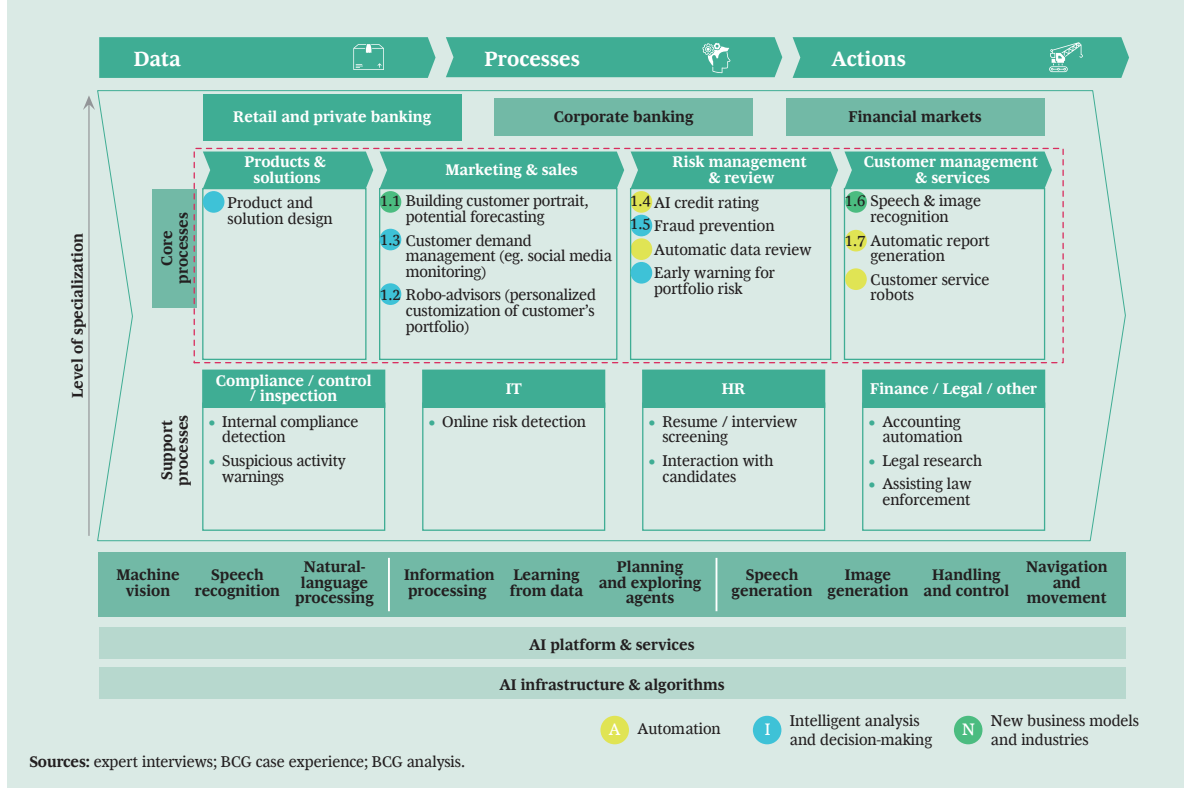
### A. Applications in the banking sector

Through case studies and expert interviews, we found that AI technology is more mature in the banking industry than in insurance and capital markets. In recent years, many Chinese and foreign banks have tested AI, and implemented it in major banking systems,

**Exhibit 3. Automation, Intelligence, Creation — Applications of AI in the Financial Sector**



### Exhibit 4. Impact of AI on a Typical Banking Value Chain



covering enterprise business and retail business from product development, marketing and sales, risk management and audit, to customer management and services. (See Exhibit 4.)

As shown in Exhibit 4, AI creates two innovative models across the four core links of the banking value chain — customer profiling & potential customer identification and voice or image recognition. AI also provides smart analysis and decision-making for the banking industry for product and solution design, customer requirement analysis, robo-advisors, fraud prevention and portfolio risk warning. AI also increases automation in credit rating, data review, report generation and customer service.

#### [1.1] Marketing and sales — customer profile creation and potential customer

identification: AI has created a new “customer profile creation” model that can create personalized labels for clients using machine learning algorithms, based on a large amount of customer data, to help recognize the best potential customers and engage in conversations with them based on their personality traits. As the

prediction and dialogue are both highly targeted, the possibility of completing a sale is greatly increased.

[1.2] Marketing and sales — customer demand management and precision marketing: In customer demand management, AI can help employees perform better and smarter analysis and make better decisions. For example, it can improve social media analysis through cognitive computing, and gain insight into customers using social media feedback, offer them personalized advice, insight and improve the customer experience. It also enables more comprehensive forecasting and meet customer requirements.

[1.3] Marketing and sales — robo-advisors: robo-advisors can be used to give customers with different backgrounds and needs advice on their investment portfolio based on market and investor data (age, client's indicated risk appetite etc.). In this case, robo-advisors is not only better at meeting customers' individual needs, but also helps banks save labor costs.

[1.4] Risk management and audit — credit score: AI can also be used to improve standardized credit scoring processes. The system analyzes data based on customer data, including their credit history, and uses machine learning algorithms to make quick, flexible and transparent credit decisions, thus reducing banks' default risk due to incorrect credit rating assessments.

[1.5] Risk control and audit — fraud prevention: AI can also deep mine a large amount of heterogeneous and varied data from internal and external sources. It can quantify data, extract risk characteristics, and use complex correlation network analysis to identify default risk indicators in real time. It uses a number of risk forecasting models including anti-fraud models, and prepay capability models to detect hidden clues in data and significantly enhance the banks' ability to prevent and control fraud risks.

[1.6] Customer management and services — voice and image recognition: AI creates new possibilities for user authentication using voice recognition technology. It can draw on more than 100 unique identifiers to verify a customer's identity. Customers create their own voiceprints to access telephone banking, removing the need to enter a series of numbers, which is more convenient for customers to use, and also improves security and fraud protection.

[1.7] Customer management and services — automatic report generation: AI can also

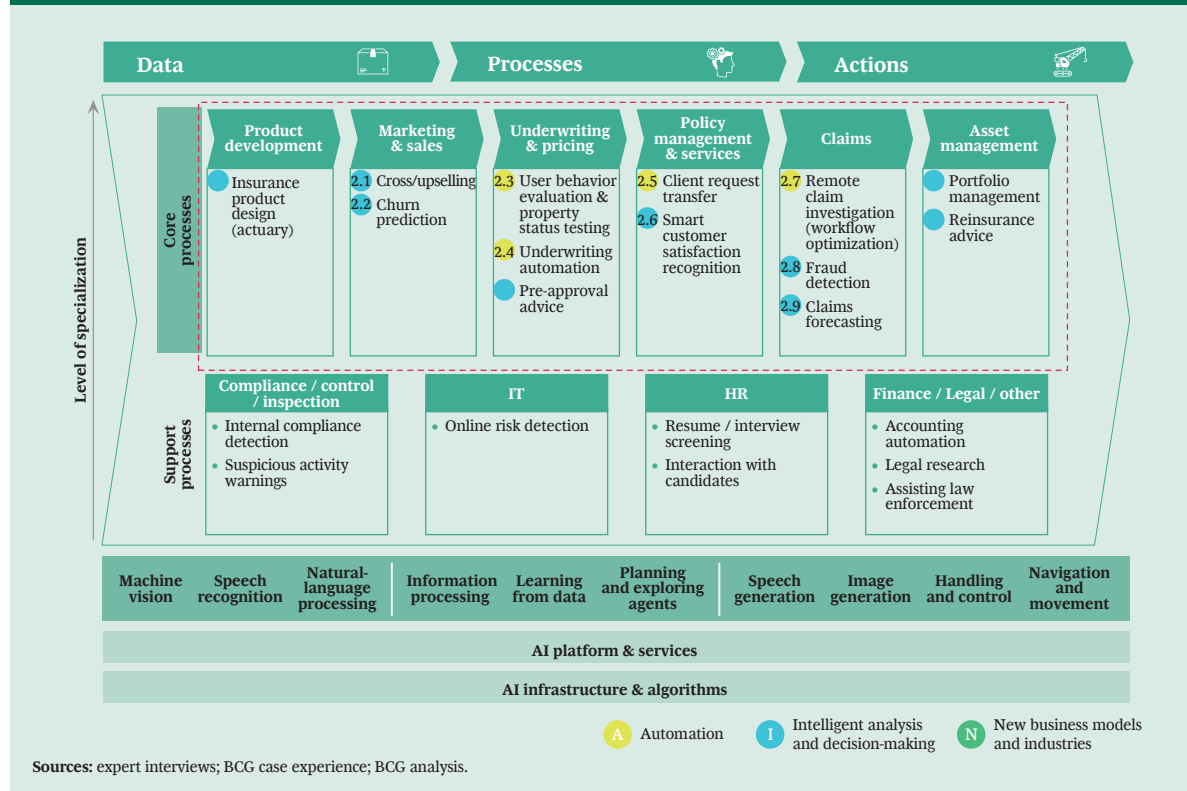
automatically generate easy-to-read portfolio performance reports for customers to improve customer relationships.

## B. Applications of AI in the insurance industry

Following expert interviews and case studies in China and overseas, we discovered AI applications in all stages of the insurance value chain. Leading insurance groups have already implemented AI across front, middle and back office processes for property and life insurance. AI not only supports core processes such as front-end marketing, underwriting and claims, but also back-end asset management. (See Exhibit 5.)

As shown in Exhibit 5, AI offers an innovative model that identifies customer satisfaction across the six core segments of the insurance industry value chain. It provides intelligent analysis and decision-making support for areas including insurance product design, cross-selling and up-selling, customer churn prediction, pre-approval advice, fraud detection, claim forecasting, portfolio management and reinsurance advice. In addition, it also

**Exhibit 5. Impact of AI on a Typical Insurance Value Chain**



increases automation in user behavior evaluation, property status detection, underwriting, customer request transfers and remote claims surveying.

[2.1] Marketing and sales — cross and up-selling: AI can be used in the financial industry to increase cross-sell and upsell success rates, based on machine learning algorithms and the application of predictive models. It can also recommend customized products based on the internal and external data for each customer and create a dynamic opportunity meter to help insurance brokers monitor and capture sales opportunities more effectively.

[2.2] Marketing and sales — loss prediction: As well as boosting sales, AI can help insurance companies reduce customer churn through data modeling. By integrating internal and external data sources, applying multiple data analysis algorithms, then comparing their performance to find an optimal algorithm, insurance companies can use AI to predict customer churn more accurately.

[2.3] Underwriting — user behavior assessment and property status evaluation: AI can carry out property status assessment and risk assessment at the underwriting evaluation and pricing stage, with the help of big data. For example, dynamic pricing of auto insurance is possible by sensing and monitoring drivers' driving behavior data. Geographical imaging data and image recognition technology can be used for underwriting housing and agricultural insurance.

[2.4] Pricing and underwriting — automation: AI can perform underwriting procedures automatically based on customer information. For example, the IBM Watson AI platform calculates claim payments by reading data such as medical certificates, medical history, and risk factors, to help insurance companies save costs and improve fraud detection rates.

[2.5] Policy management and services — automated claims processing: using scanning and recognition technology, insurance companies can process customer claims more efficiently. For example, they can process a large number of documents automatically by scanning them and then processing them using analysis software, thereby reducing labor costs.

[2.6] Policy management and services — smart identification of customer requests: by applying NLP technology, insurance companies can convert the contents of customer conversations with customer service representatives during phone calls into text in real time, analyze and extract the contents and take the appropriate steps. Actions



could include dividing calls into specific business categories and assessing their priority, in order to identify customer issues rapidly, reduce the time spent on calls and improve customer satisfaction.

[2.7] Claims — remote claim investigation (workflow optimization): insurance companies can apply AI technology to carry out remote surveys. For example, when processing auto insurance claims, AI can assess the extent and classification of the damage to a car by analyzing images, then assign the claim to the appropriate workflow, thereby reducing costs.

[2.8] Claims — fraud detection: another important application of AI in the claim process is detecting fraud, through a combination of unsupervised and supervised learning algorithms with network analysis, as well as quicker parallel computing of uncorrelated databases to improve the accuracy of fraud detection.

[2.9] Claims — claim forecasting: AI can also automatically predict the severity of customer claims through data modeling and analyze large amounts of internal, third party and social media data using neural networks to improve the accuracy of claim prediction.

### **C. Applications of AI in the capital markets**

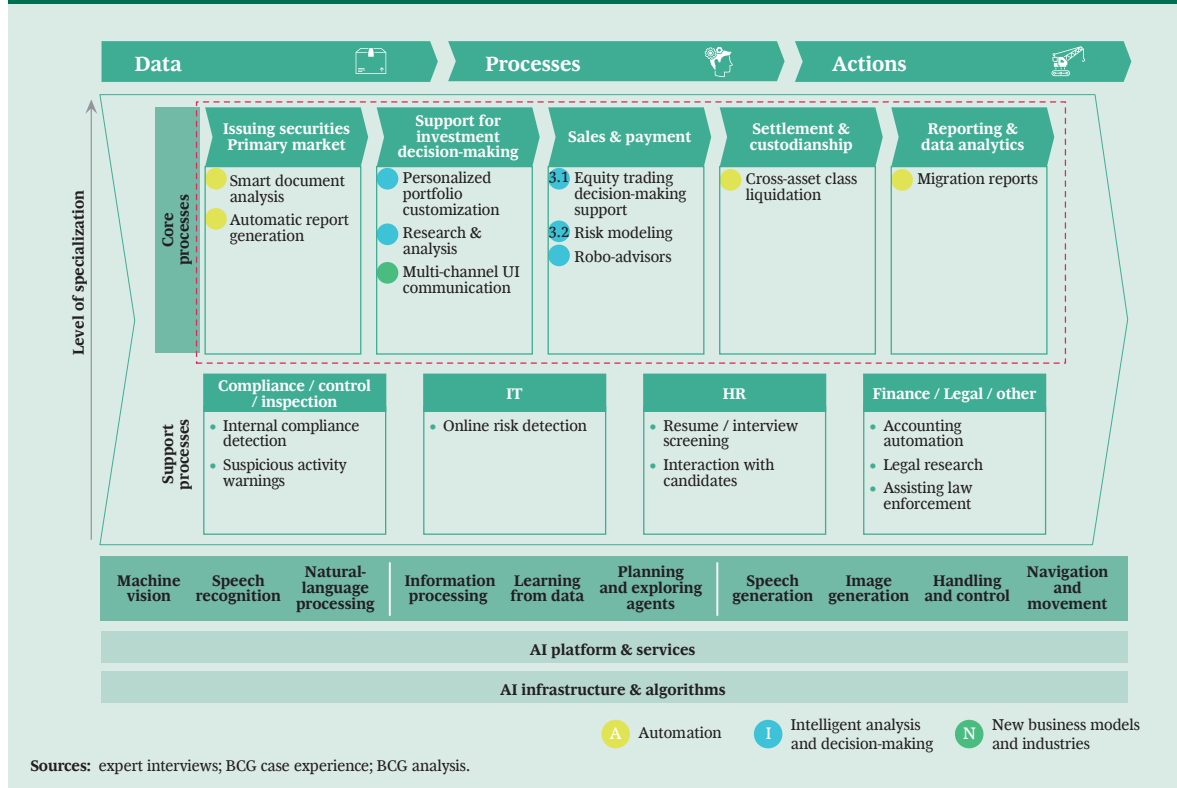
Through case studies and expert interviews, we have identified broad prospects for AI in the capital markets. Leading Chinese and international securities firms have begun to explore the potential applications of AI in all aspects of securities issue, investment decision support, sales and trading, data analysis and reporting. (See Exhibit 6.)

As shown in Exhibit 6, AI offers an innovative, multi-channel information communication model across the five core parts of the capital market business value chain. It supports intelligent analysis and decision-making in areas such as personalized portfolio construction advice, stock trading decision support, research and analysis, risk modeling, robo-advisors; and increases automation in intelligent document reading, automatic report generation, cross asset clearing, mobile reporting and other activities.

[3.1] Sales and trading — stock trading decision support: in an age when the volume of market information has increased significantly, stock information analysis, which used to require a lot of manual work, can be executed quickly and on a large scale using AI. For example, millions of social media messages and data from other non-traditional information sources as well as traditional economic databases can be analyzed instantaneously using a big data-based machine learning algorithm, and



## Exhibit 6. Impact of AI on a Typical Capital Market Value Chain



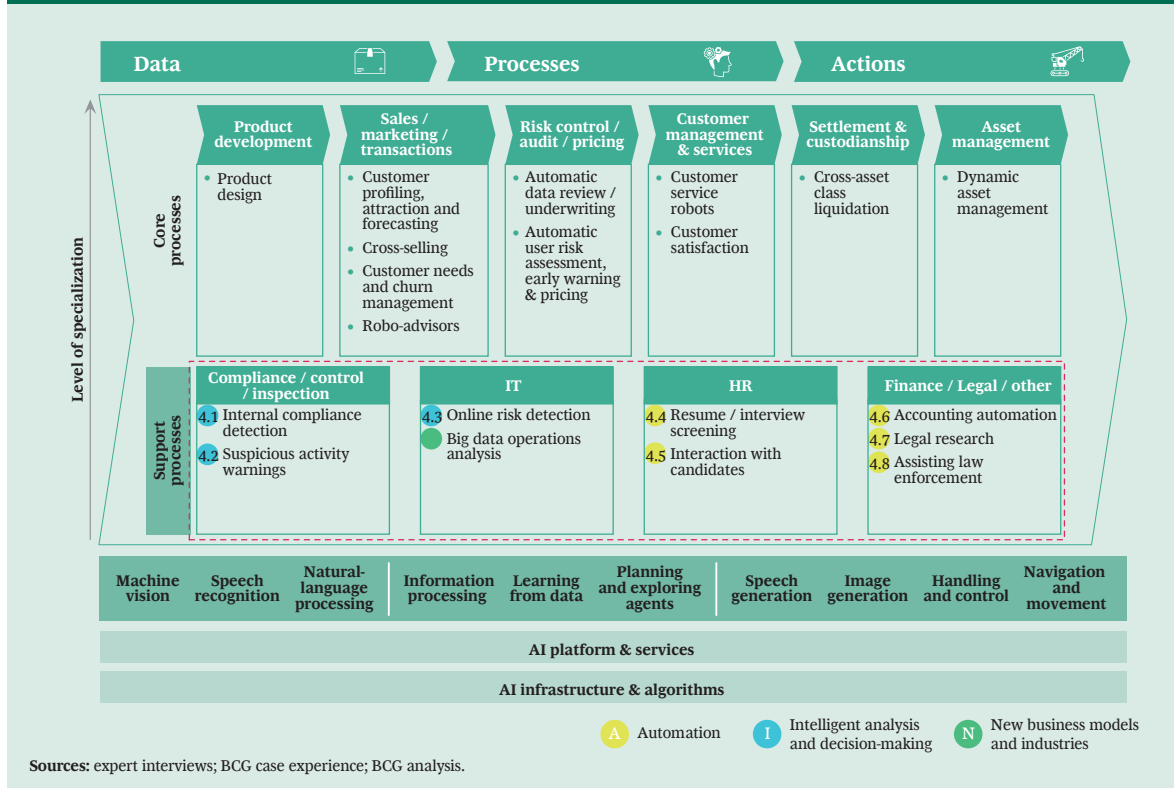
perform analysis on historical data and statistical probability by machine learning to identify black swans before the market reacts.

[3.2] Sales and trading — risk modeling: in risk management, AI can identify complicated structured and unstructured data sets and automatically apply machine learning to risk modeling in a standardized way to effectively reduce the time required for risk modeling.

### D. Application of supportive functions in the financial industry

Compliance, IT, human resources, finance and other back-office supporting functions in the financial industry involve a lot of highly repetitive work, which is easily replaced by the application of AI to many such processes that are common to the financial sector, including the banking and insurance industry and capital markets. Based on a large number of case studies, we found that AI can be applied widely to various aspects of back-office functions that involves compliance risk testing, data analysis, document processing and other activities. (See Exhibit 7.)

### Exhibit 7. Impact of AI on Support Processes for FIs



As shown in Exhibit 7, AI offers an innovative big data operation analysis model in the four major types of FI support processes. It promotes intelligent analysis and decision making in areas such as internal compliance detection, suspicious activity alerting and cyber risk detection. It also increases automation in resume / interviewee screening, interaction with candidates, accounting automation, legal research and law enforcement assistance. We will discuss the eight application scenarios of AI in FI support processes below.

**[4.1] Compliance / risk control / auditing — internal compliance detection:** AI can help financial institutions meet ever-stricter compliance requirements through techniques such as NLP and information processing. For example, it can monitor trading floor communications through speech recognition and natural language processing, and apply machine learning algorithms to detect abnormalities in dialogue to reduce labor costs in internal compliance monitoring.

**[4.2] Compliance / risk control / auditing — suspicious activity alerts:** AI can reduce

the need for manual detection of violations and report writing through machine learning, analyzing large volumes of trading data, capturing suspicious irregularities, and automatically generating reports of suspicious activities.

[4.3] IT — network risk testing: Through data analysis, AI can continuously monitor network activities, identify abnormalities and quickly resolve accidents, thereby reducing the manual labor required for monitoring.

[4.4] HR — resume / interviewee screening: AI analyzes the characteristics (voice, demeanor, facial expressions etc.) of interviewees in video interviews through NLP and machine learning, and compares them with the characteristics of current high-performing employees to assess the potential of interviewees, not only to avoid human bias, but also to reduce the interviewer's workload.

[4.5] HR — interaction with candidates: AI is capable of performing machine-learning on historical conversations between recruiters and candidates, and enables conversations with candidates through NLP and language generation technologies to allow the system to interact with candidates on behalf of the recruiter in the future.

[4.6] Finance / Legal / others — accounting automation: AI can use scanning and image recognition technology to automatically process accounting documents and receipts, and analyze and process relevant data to effectively reduce accountants' workload.

[4.7] Financial / Legal / others — legal research: AI is able to launch queries about legal issues and get answers in natural language, as well as automatically scan a large volume of relevant documents to find relevant cases and collect useful information, which significantly reduces the workload of legal practitioners in finding research cases and collecting information, to free up their time for other jobs.

[4.8] Finance / Legal / others — assisting law enforcement: AI can identify relevant information from huge, complex information pools through machine learning and assist investigators in forming insight and predicting potential crimes.

### 3. Restructuring the Financial Labor Market: Replacement, Improvement and Creation

#### 3.1 Three Types of Impact by AI on the Financial Job Market

Based on the applications of AI in the different business value chains of the financial sector, we see three major types of impact of AI on the financial job market — **job cuts**, **increased efficiency** and **job creation**. Of these three areas, job cuts and increased efficiency will impact existing positions, while job creation reflects the incremental potential impact of AI on the job market. The further distinction between job cuts and increased efficiency is based on a judgment as to whether the manual work replaced by AI can be considered the core value-creating activity of the position. That is to say, if the core value of a job post can be created by AI rather than by manual work, then the position can be eliminated due to AI. If AI cannot replace the core value creation activity of a position, in other words it is still dependent on manual work, and AI is only playing an auxiliary role for the completion of non-core tasks, then this is considered an increase in efficiency.

##### 1) Job cuts

AI is able to replace some aspects of the work in existing positions. If the core value-creating activity is manual work that can be carried out by AI, then the job position can be classified as replaceable by AI, and existing employees can be transferred to supervision, management or other positions. According to academic research, manual work that can be replaced by AI can be divided into two categories: routine tasks that follow certain steps and thus can be programmed, and non-cognitive and non-interactive tasks that do not require complex problem-solving ability or innovation to deal with emotional interactions or a changing environment. In the financial sector, a large number of jobs still involve such core value creation activities. These jobs are likely to be phased out in the future as AI is applied, including back-office and supporting job posts, as well as front-office bank tellers focused on data analysis and document processing, insurance underwriting and other similar jobs. The specific positions will be described in detail in the scale estimation in the third part.

##### 2) Increasing efficiency of existing job posts

As mentioned earlier<sup>6</sup>, when the core value creating activity in a certain position is man-

<sup>6</sup> Brynjolfsson & McAfee (2014): The Second Machine Age; Frey & Osborne (2013): The Future of Employment: How Susceptible are Jobs to Computerisation?

ual work that cannot be replaced by AI, and AI mainly plays an auxiliary role, then the position will not be replaced and AI will mainly help reduce working hours, and thereby improve efficiency. There are two further outcomes that can result from increased efficiency: one is to increase output without a reduction in personnel, and the other is to reduce headcount, with constraints on potential output. In other words, the job positions will still exist but whether the headcount will be reduced depends on whether the potential market demand can support the employment needs of a sufficient number of staff.

According to related literature, manual work activities that cannot be completely replaced by AI technology are those non-routine activities that do not follow a clear procedure, and work that requires complex problem-solving ability or innovation to deal with emotional interactions or random changes in the environment. In the financial sector, there will still be a large number of such positions in the future, with core value creating activities that cannot be replaced, for example account managers and HR manager positions that require frequent interpersonal communications, and investment manager and financial planner positions that need to solve complex issues. The specific positions will be described in detail in the scale estimation in Part 3.

### 3) Job creation

While it replaces some jobs, the development and applications of AI technology are also creating vitality in the financial job market. AI creates a large number of jobs in development, operations and applications. In addition to the emerging AI technologies or infrastructure providers, we believe AI will create three types of new jobs within the financial sector: **technical**, **operational** and **business**.

Technical positions include data scientists, system architects, development engineers, algorithms and system testers. Operational positions are responsible for the operations and maintenance of systems related to big data and AI products to ensure consistent product quality, legal and business compliance. Business jobs are positions that involve a combination of technology and business activities such as algorithmic analysts who are not only able to act as interpreters of business requirements and technical algorithms between tech departments, business departments and service departments. This category also includes business development specialists who can quickly understand and learn about cutting-edge technologies and apply them to existing businesses.

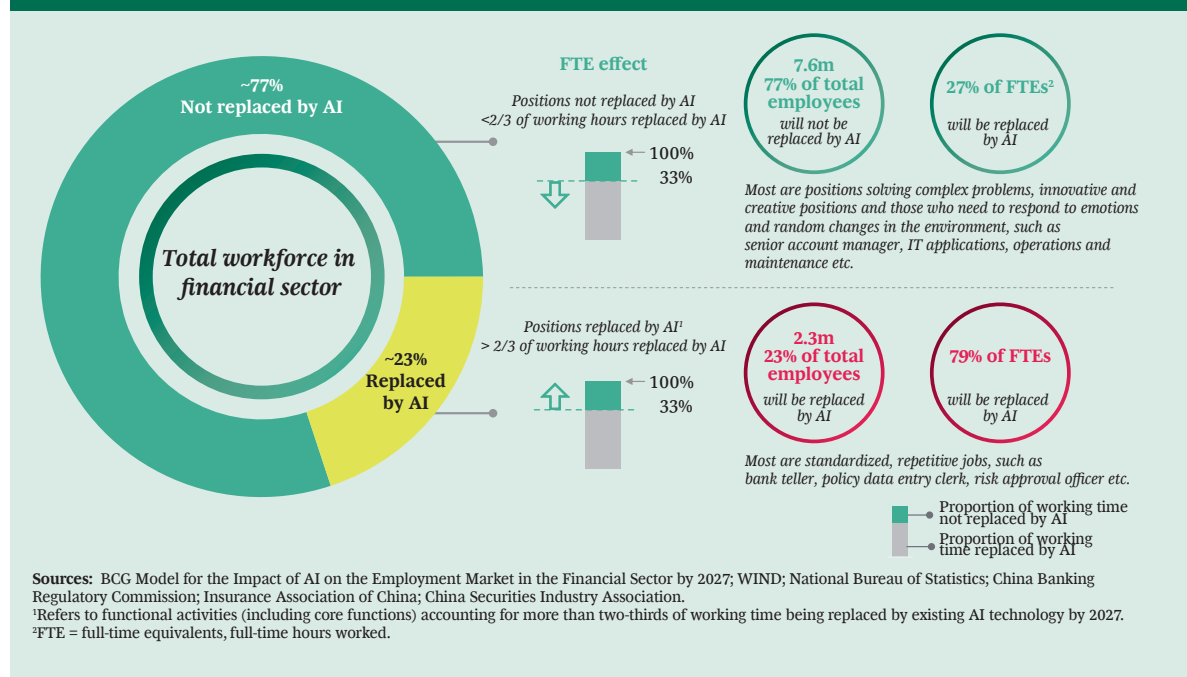
However, the score of the impact of AI on the financial job market is much greater than these case studies. As mentioned earlier, employment opportunities arising from new business models created by AI will continue to emerge in the future as the industry grows.

### 3.2 Quantitative Analysis of the Impact of Job Cuts and Increased Efficiency

As mentioned above, 2017 could be described as the beginning of a new era for AI in China. After the State Council issued the “New Generation AI Development Plan”, AI has begun to appear on the radar for the government and enterprise managers. In response to this development, BCG has taken 2017 as the base year for analyzing and estimating the impact of AI on jobs on different business value chains in the financial sector.

We estimate that by 2027, 23% of the jobs in China’s financial sector will either be cut by AI or will be transformed into new positions, and the remaining 77% jobs will not be replaced but the efficiency of these positions will increase. The jobs that will be replaced by AI mainly consist of standardized and repetitive tasks. We estimate that by 2027, about 2.3 million people will be affected, or 23% of the total workforce in the financial sector. The remaining 7.6 million people, those who need to solve complex problems and respond to emotional interactions or random changes in the environment, will not be replaced by AI. Instead, they will be able to increase their working efficiency using AI. (See Exhibit 8.)

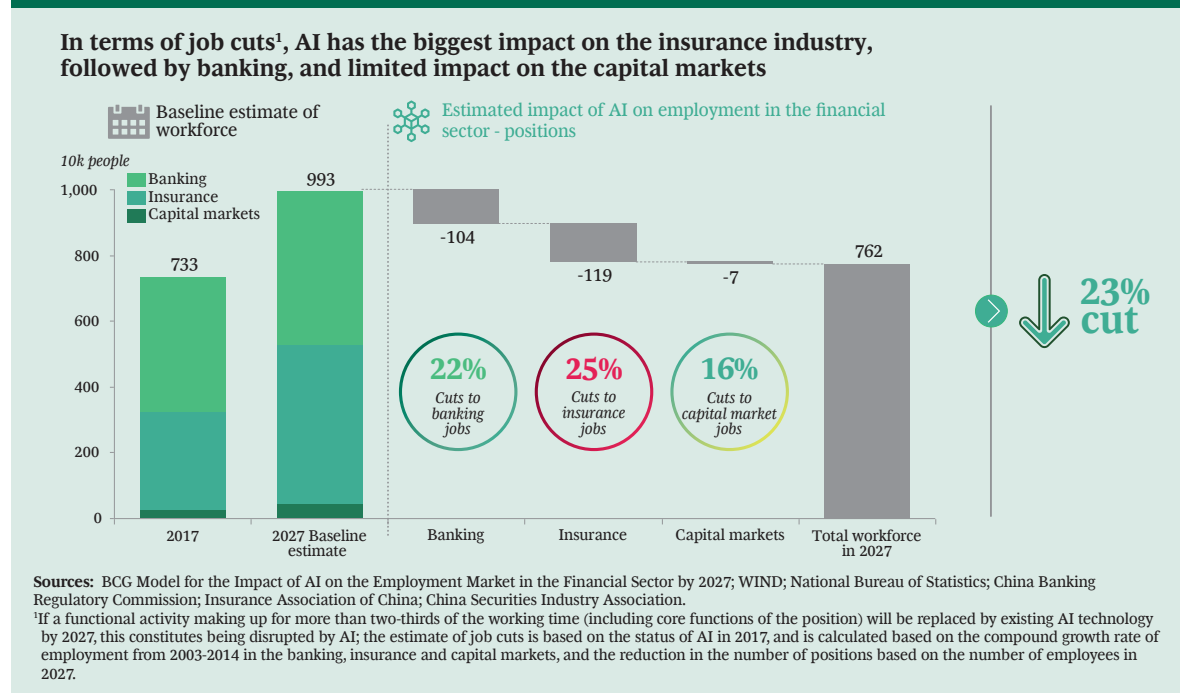
**Exhibit 8. Proportion of Jobs in China’s Financial Sector that Will Not Be Replaced by AI**



In the meantime, we also considered the characteristics of China's financial industry in its estimation. Although China's financial sector employs more people than most other countries do overall, it also serves a much larger customer base. Therefore, the number of employees per client is not much higher than other countries. In addition, due to the meteoric development of China's Internet industry in recent years, China's finance companies are developing and applying more advanced Internet technology than other countries. For instance, online banking and mobile banking are widely used by banking customers in China. These technologies have already replaced a considerable amount of manual work. Therefore, the impact of AI on the China's financial job market may not be as severe as in other countries.

In the financial sector, 2.3 million jobs are likely to be replaced by AI by 2027, a reduction of 23%. (See Exhibit 9.) The insurance industry will be most strongly affected, with 25% of jobs cut, followed by the banking industry with about 22% of jobs cuts. The capital markets will be the least affected, with about 16% of positions replaced by AI. Capital market business requires a large amount of diverse industry data and information, from which it is difficult to extract valid information efficiently, and in many cases this information cannot be obtained using machines or algorithms. This feature means that AI is unlikely to replace many jobs in the banking and insurance industries in the short term. Positions in finance,

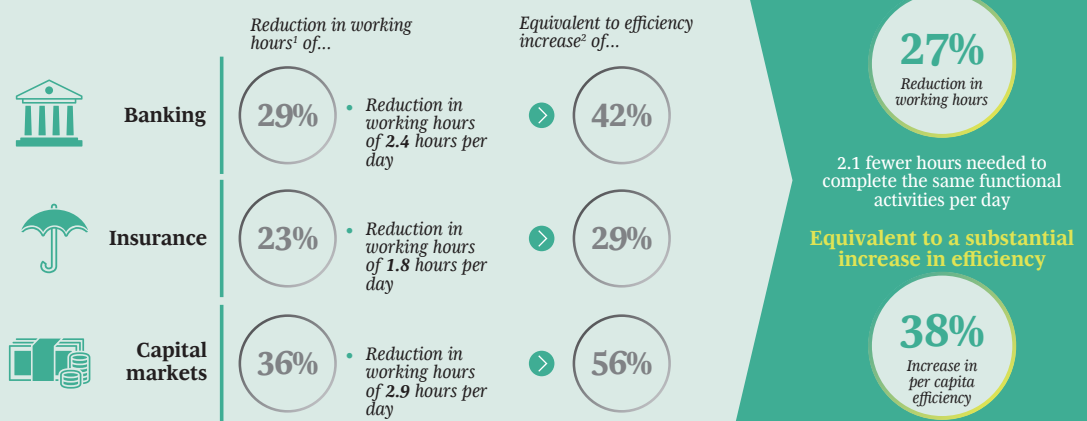
### Exhibit 9. Job Cuts in China's Financial Sector Caused by AI





### Exhibit 10. Increases in Efficiency in China's Financial Sector due to AI

As well as replacing jobs, AI will raise efficiency significantly in the remaining jobs in the financial sector



**Sources:** BCG Model for the Impact of AI on the Employment Market in the Financial Sector by 2027; WIND; National Bureau of Statistics; China Banking Regulatory Commission; Insurance Association of China; China Securities Industry Association.

<sup>1</sup>Reduced working hours refers to activities that could be carried out using existing AI technologies in positions that have not been replaced by AI by 2027 (where less than two-thirds of working hours have been replaced by AI); the estimate of reduced working hours is based on the status of AI in 2017, and is calculated based on the compound growth rate of employment from 2003-2014 in the banking, insurance and capital markets, and the reduction in the total number of working hours of the total number of employees in 2027.

<sup>2</sup>The increase in efficiency refers to the increased efficiency from the reduction in working hours after applying AI.

trading, risk auditing, customer service and background finance are much more likely to be replaced. Although there may still be a few people left behind to supervise the work of AI, since these posts are highly automated, we have not included them in the estimate.

In terms of increasing efficiency, AI can reduce the number of working hours in posts, which is equivalent to an improvement in efficiency. (See Exhibit 10.) According to our estimate, AI will reduce the total working hours in the financial industry in positions not been replaced by AI by 27% in 2027, equivalent to an average reduction of 2.1 hours per day on the same functional activities, and an efficiency improvement of 38%. The biggest improvement will be in the capital markets, followed by the banking industry. In product development, sales, investment decision making and asset management, AI has replaced some of simpler areas of work lower cognitive requirements, and improved the accuracy of some areas in comparison with manual operations, which results in productivity and efficiency improvements.

In terms of employment, AI will create new posts while replacing low-skilled posts. According to a Gartner<sup>7</sup> report, AI will create more jobs than it replaced from 2020, replac-

<sup>7</sup>Gartner (2017): Top Strategic Predictions for 2018 and Beyond: Pace Yourself, for Sanity's Sake.



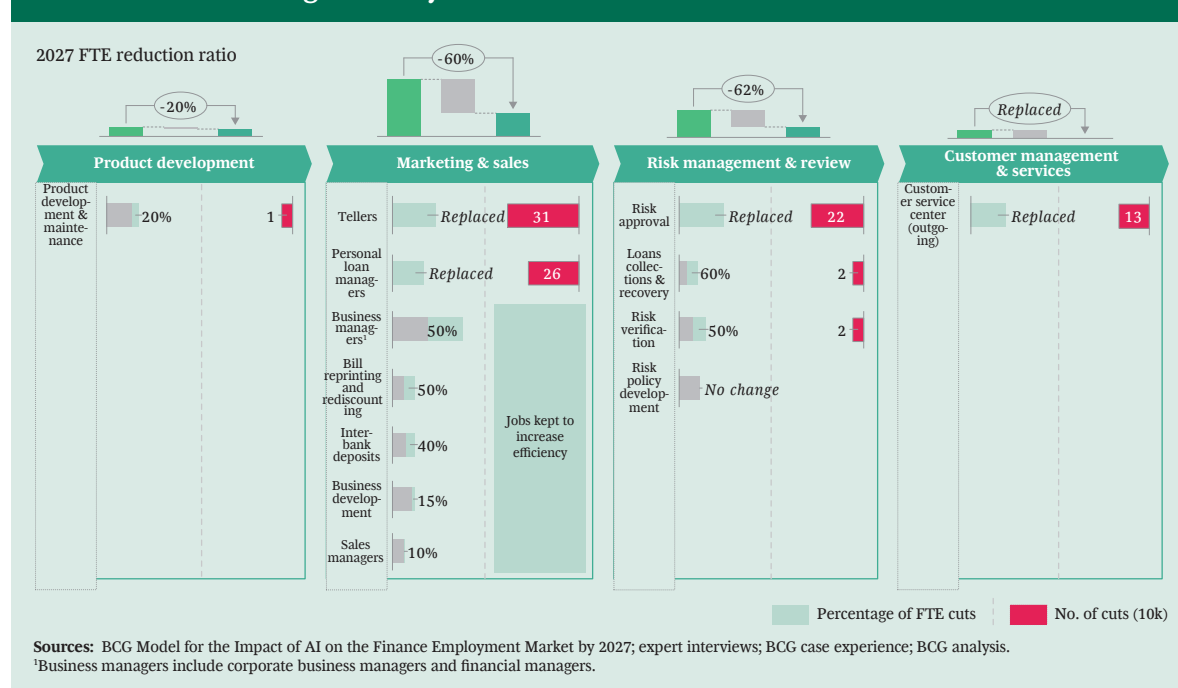
ing 1.8 million working posts and adding 2.3 million new jobs. At present, China's overall AI talent gap is as high as one million, and the demand for new posts has doubled every year in the past two years. Focusing on the financial field, the number of new posts in the AI field and the talent demand is huge, especially for AI technology R&D personnel, operational specialists and AI business development experts, which creates new requirements for R&D, operation & maintenance in all parts of businesses.

### 3.2.1 Impact on the Employment Market in the Banking Industry

As mentioned above, in a robust development scenario, the banking industry will cut 1.04 million jobs by 2027, a drop of 22%. The remaining 78% of jobs will see efficiency increases of 42%, equivalent to a reduction of 2.4 hours per person per day in the same functional activity. (See Exhibit 11.)

In terms of job cuts, AI will mainly affect marketing and sales, risk control and audit, customer management and services in the front office and middle offices in the banking industry. We estimate that AI will eliminate 570,000 jobs in marketing and sales; 220,000 jobs in risk control and audit, and 130,000 jobs in customer management and service. AI will replace the core work of tellers, transferring business processes, and cash counting to

**Exhibit 11. Estimated Impact of AI on the Front Office and Middle Office Value Chain in the Banking Industry**



machines, such as smart VTMs. AI is also being applied to personal loan cases. Data mining technology, intelligent analysis and processing models can help personal loan managers and risk assessment officers to collect, evaluate, approve and manage personal loan qualifications. In the customer service chain, AI can take the place of customer service advisors to meet the needs of customers calling in. This field will be expanded in the future.

Although the 22% of jobs described are likely to be replaced by AI due to their highly standardized operations and lower requirements for emotional interaction, the remaining 78% of jobs in the banking industry will not completely be replaced by AI in the next decade. For example, client managers need to talk to customers face to face to outline complex financial products and build relationships to influence and help customers buy bank products. Banks may be able to serve the mass market through AI customer service in the future, but middle and high net worth customers may still want to see a real client manager. AI will not completely replace these positions, but it can significantly improve efficiency, especially in customer service, marketing and sales, risk control and audit, so that AI can serve large numbers of customers, gain customer insight and assess credit risk.

We estimate that AI will reduce 62% of the working hours of **risk control and audit positions**, and 60% of working hours in **marketing and sales positions**. AI and big data have been also used to improve client managers' efficiency. In the future, it will be possible to sort and analyze huge customer bases using customer labelling and profiling technologies. Client managers will only need to select a category of customers, and the system will automatically recommend the appropriate product according to the asset allocation. In the past, a client manager might only manage a few customers, but with the help of AI, they will be able to cover categories of customers, thus providing more extensive and in-depth service, responding better to customer needs and providing customized services.

### Impact of AI on employment in the banking industry

According to a Reuters report from November 2017, National Australia Bank (NAB) announced staff cuts of 4000 people over the next three years — roughly 12% of its current employees — and the bank is transitioning to AI and automation by investing in new technologies. NAB's downsizing is in line with international banking trends, namely the introduction of new technologies such as AI, to replace customer service personnel and the use of digital channels to replace tellers. NAB's CEO Andrew Thorburn said, "As we simplify, we automate processes and things move to digital channels, we will need less people and as that happens we estimate that there will be 6000 less people needed in three years' time. Having said that, we're hiring 2000 people with different capabilities: data scientists, AI, robotics, automation, technology people, digital people, so the net job loss will be 4000 and that's just a reshaping that's going to happen."

In China, the big five state-owned banks are also embracing smart technology. Smart counters, robots, customer service and other products are replacing tellers. Moreover, banks have established big data platforms and data management capabilities to promote the AI applications for credit risk pre-warning, anti-money laundering, anti-fraud and smart credit loan approvals, and assist with the manual risk control in the credit loan business.

Based on biannual reports, the big five state-owned banks cut 162 outline in the first half of 2017, and decreased the number of tellers by 27,104 as they rolled out smart tellers. By the end of October 2017, China Construction Bank had installed more than 60,000 smart teller machines. Up to 88% of counter business was moved to the machines, including 290 types of non-cash business. Smart “Xiaowei” robots served more than 2.3 billion customers, equivalent to more than 10,000 staff. In July 2017, a smart robot jointly researched and developed by China CITIC Bank and Baidu appeared at the 25th International Financial Exhibition. The robot is able to communicate with the customers intelligently by utilizing cutting-edge technologies such as NLP, 1:N face recognition, and a knowledge of the banking business based on the deep learning. In the future, such robots will replace lobby managers in China CITIC Bank outlets, performing functions such as recognizing VIP customers, banking business consultations and product recommendations.

China’s largest domestic banks are testing the application of big data and AI in risk control to improve the accuracy and work efficiency for risk recognition. China Everbright Bank established a scientific and technological innovation laboratory in 2012, later launching five data products in the risk control field, including filtering, risk community trees, big data for credit checking, “Where have my loan funds gone?”, and the Simpsons detection model. It carried out correlation analysis and data mining based on a complex network to help recognize and warn against bad credit assets, reduce bank losses and increase the efficiency of loan officers.

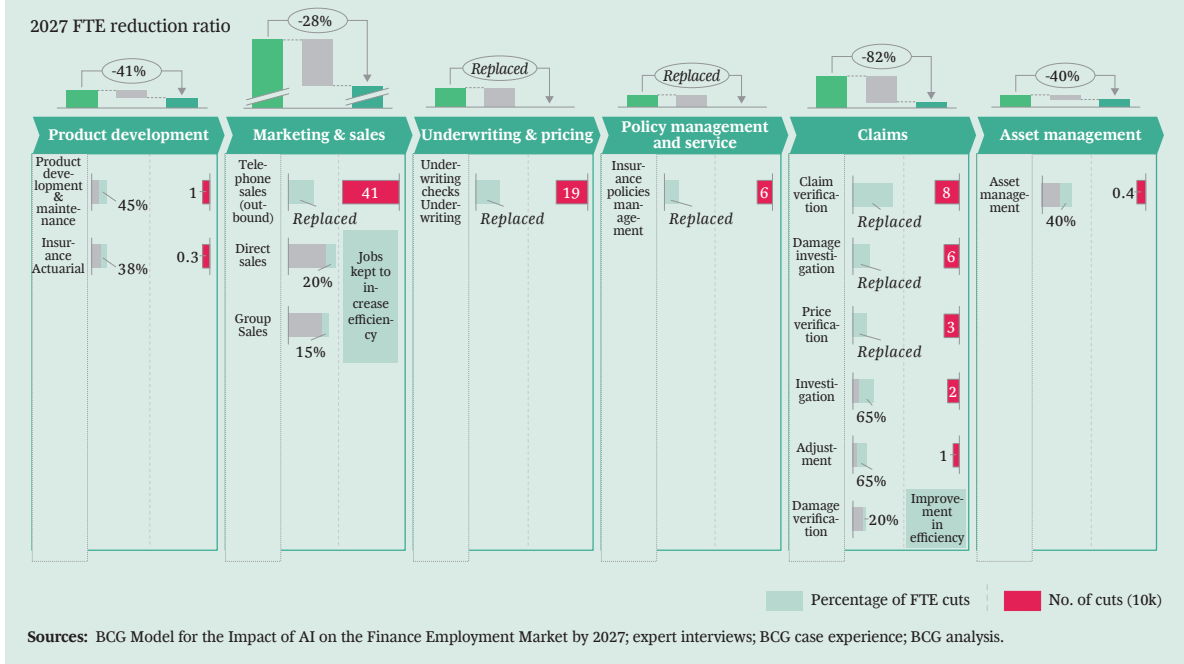
### 3.2.2 Impact of AI on Employment in the Insurance Industry

AI technology has many potential applications in the insurance industry, therefore it will have a big impact on the employment market. We estimate that AI will reduce the number of jobs in the insurance industry<sup>8</sup> by 1.19 million by 2027, a 25% decrease. Efficiency in the remaining 75% of jobs will increase by 29%, equivalent to a reduction of 1.8 hours per person per day in the same functional activity. (See Exhibit 12.)

In the insurance industry value chain, AI will replace positions **in marketing and sales**,

<sup>8</sup> Excluding insurance agent positions.

### Exhibit 12. Estimated Impact of AI on the Front Office and Middle Office Value Chain in the Insurance Industry



**underwriting, insurance policy management, service and claims.** We estimate that the AI will eliminate 410,000 jobs in marketing and sales, accounting for 34% of total cuts. In the future, with the development of the speech recognition and synthetic technology, robots will replace most product recommendation by human customer service representatives. They are able to capture customers' mood and preferences quickly from their speech, thereby increasing the efficiency of sales and saving costs.

In addition, AI will replace around 190,000 million jobs in underwriting and pricing, accounting for 16% of total job cuts. These positions are highly standardized and programmable, and therefore have been widely replaced by robots. We anticipate that the speed of job replacement will accelerate in the future. Similarly, about 60,000 jobs will be cut in insurance policy management and services. As a highly standardized section of the claims process, damage evaluation, pricing and claim settlement positions will also be replaced by 2027, involving a reduction of 170,000 jobs.

AI can help increase efficiency in many segments of the insurance industry value chain. In the product development chain, AI can help insurance actuaries to collect a market data and optimize the actuarial model, while also enabling product designers and maintenance staff understand changes in market demand and analyze competitors' products,

so that they can adapt to market demand more accurately and rapidly and develop more competitive products. However, since product development requires a lot of communication and decision-making, AI will not replace these positions completely. We predict that AI will cut about 41% of working hours in insurance product development.

We argued above that the most direct impact of AI on marketing and sales posts is in telesales, while it will help salespeople speed up document collection, information processing, data organization and other document work in direct sales and group sales, which have higher communication requirements. In the future, AI will cut working hours in sales positions by 28%.

The changes in demand for different sales channel positions in the insurance industry may also be influenced by the changes in sales models as the industry develops, not purely due to developments in AI. For example, the rapid decline in direct sales representatives over the past several years has been due to the development of the internet and the decline of agents, therefore such sales models do not meet customer requirements.

AI will also increase the efficiency of processing claims, in surveying, adjustment and damage evaluation. For example, damage surveying is a key requirement of auto insurance, and is highly labor intensive. With the development of computer vision, customers can photograph evidence and upload it onto the system on-site. The system then carries out a remote survey by scanning the image, greatly reducing the need for field surveys. However, since this process is dependent on customers, it is difficult to guarantee the definition, authenticity and extent of the photos, therefore on-site surveys will still necessary – damage investigators will not be completely replaced by AI. Furthermore, during the process, agents need to notify customers, receive their feedback, acceptance or refusal. AI can handle the notification and feedback stages, which are more standardized, however at the last stage individual cases vary significantly, therefore more communication is required and it is difficult for AI to replace human workers. The adjustment steps involves a lot of data verification, calculation based on rules and regulations, and other repetitive work. AI can help staff handle such standardized cases rapidly, however, professional personnel will still be required to handle non-standardized cases due to the importance of compensation adjustment decisions and the complexity of cases. AI can however help to save time in the document review process via biometrics and other AI technologies, thereby improving the user experience.

Finally, in asset management, AI can recognize the assets with the best ROI for fixed model investment, monitoring and analysis of ROI and risk data, and adjust an asset portfolio in real time to maximize benefits and prevent risk to increase reaction times and

efficiency in asset management operations. However, since asset management is closely tied with investors' goals and preferences and other personal factors that can change easily, it is difficult to define behavior in the asset management chain with a fixed algorithm, therefore AI is highly necessary. We predict that AI will reduce working hours in asset management in the insurance industry by 40%.

### **Impact of AI on the employment market in the insurance industry**

In January 2017, the Japanese media reported that Japan's Fukuoka Mutual Life Insurance Company plans to introduce IBM's AI system - Watson. The system is capable of collecting information for insurance claim capital, including medical records, the duration of hospitalization and the name of the surgical operation by "reading" medical certificates and other documents. The system can also check customers' insurance contracts and identify special clauses to prevent claim negligence. It can verify 132,000 cases every financial year, and save the Group about 140 million yen. Fukuoka is mainly applying Watson to process large amounts of data, replacing members of staff who previously carried out this work. According to reports, Fukuoka plans to cut nearly 30% of staff in the insurance claim evaluation department, and about 34 staff responsible for analyzing insurance claims will be replaced by AI.

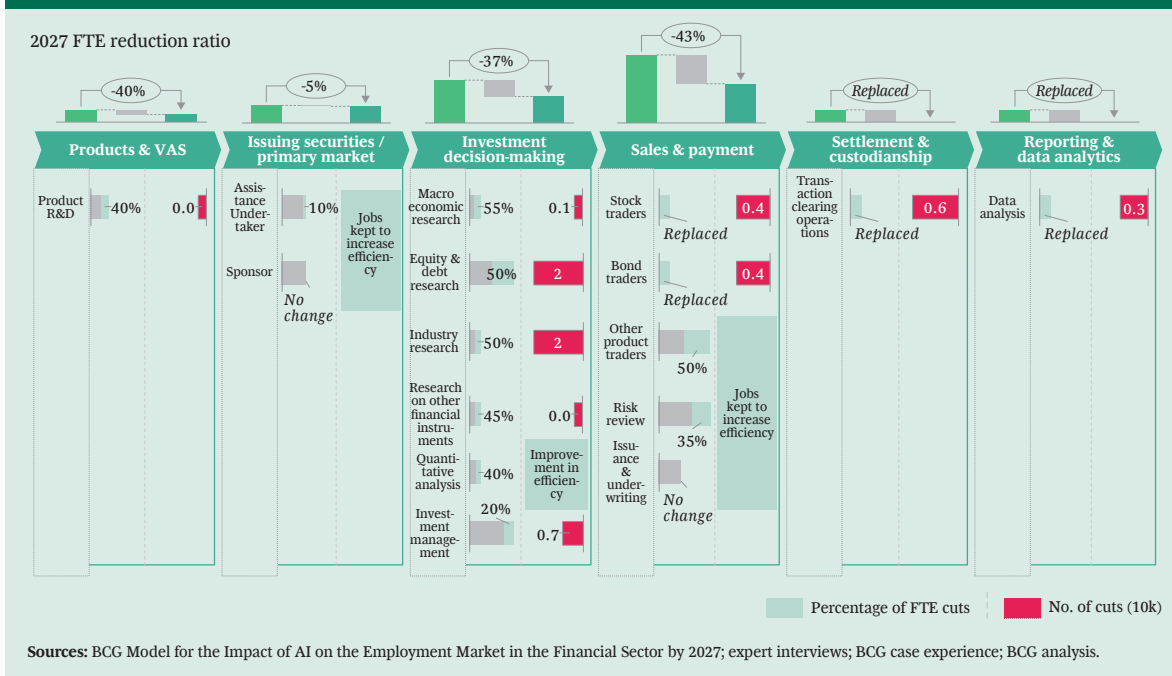
In China, Ping An Insurance launched "smart authentication" and "smart rapid compensation" products to the industry in September 2017 to increase efficiency at the underwriting and claim stages. The "smart authentication" product can verify relevant behavior and attributes of the agent and insurer using face recognition, voiceprint recognition and other biometric technologies to reduce the dispute rate during the policy sales process, and shorten policy issuance and claim processing times, covering over 90% of the work of customer services representatives in insurance companies. "Smart rapid compensation" is widely used in auto insurance claims settlements. It can help identify the model and damage to a vehicle with a high level of precision, provide accurate maintenance program pricing, and perform intelligent risk interception using multivariate algorithm analysis. In the first half of 2017, Ping An Property Insurance dealt with more than 4.99 million auto insurance claims, and smart interception of risk leakage reached 3 billion. After the product is promoted on a larger scale, it is expected that the efficiency of claims operations in the auto insurance industry can be improved by more than 40%.

### **3.2.3 Impact of AI on the Employment Market for Capital Markets**

As mentioned above, AI will replace 70,000 jobs in capital markets by 2027, a reduction of 16%. The efficiency of the remaining 84% jobs will increase by 56%, equivalent to a reduction of 2.9 hours per person per day in the same functional activity. (See Exhibit 13.)



### Exhibit 13. Estimated Impact of AI on the Front Office and Middle Office Value Chain in Capital Markets



In the capital markets value chain, AI is expected to replace jobs in sales transactions, clearing and settlement. We estimate that 7% of jobs in sales and trading will be cut. AI may even completely replace clearing, settlement, basic reporting and data analysis positions. The core work in the majority number of trader positions of executing transaction instructions will be gradually replaced by AI trading systems. For example, JPMorgan Chase & Co started to implement AI code-named LOXM in 2017 for high-frequency trading in European stocks. The AI clearing system will replace the current clearing and settlement positions, liquidating client and free assets more accurately and efficiently.

As stated above, AI will not disrupt positions in the capital markets on a large scale, but it will significantly improve the efficiency of all sections on the value chain, especially smart investment decision-making and asset management. In the future, AI will be combined with classical economics and investment research theory to enable macroeconomic research through big data analysis to improve efficiency and accuracy. At the same time, investment consultants, including financial management consultants and investment advisors will refer to the results of the AI analysis system and improve them based on their own project experience. We estimate that AI will reduce the number of working hours required for investment decision support by 37%.

### Impact of AI on employment in the capital markets

Goldman Sachs Group is one of the leaders in technological change in the capital markets. According to the MIT Review, more than 600 cash stock traders were responsible for processing transaction instructions from clients in Goldman Sachs' New York headquarters in 2000, while only two of them are now left, as automatic transaction procedures maintained by 200 computer engineers are able to carry out most of the work automatically. At first, Goldman Sachs used sophisticated trading algorithms (some of which have machine learning capabilities) to replace simple transactions, then it applied them gradually to replace more complex foreign exchange and credit transactions. In order to complete the transactions, the algorithms were designed to simulate the operations of human traders. According to Goldman Sachs' CFO, the Group has started to carry out the automatic foreign exchange dealing. It is estimated that a computer engineer, on average, can replace four traders. At present, computer engineers account for a third of the Group's staff.

AI is also gradually replacing the work of many well-paid front office staff. In the next step, Goldman's investment banking business will also be automated. Even though the jobs that emphasize interpersonal skills like selling and establishing customer relationships will not be replaced entirely, Goldman has divided the process of completing an initial public offering (IPO) business into 146 clear steps, with many of the steps marked as "should be automated". Since employee remuneration in the investment banking division is generally high, reducing the number of investment bankers is expected to save Goldman huge labor costs.

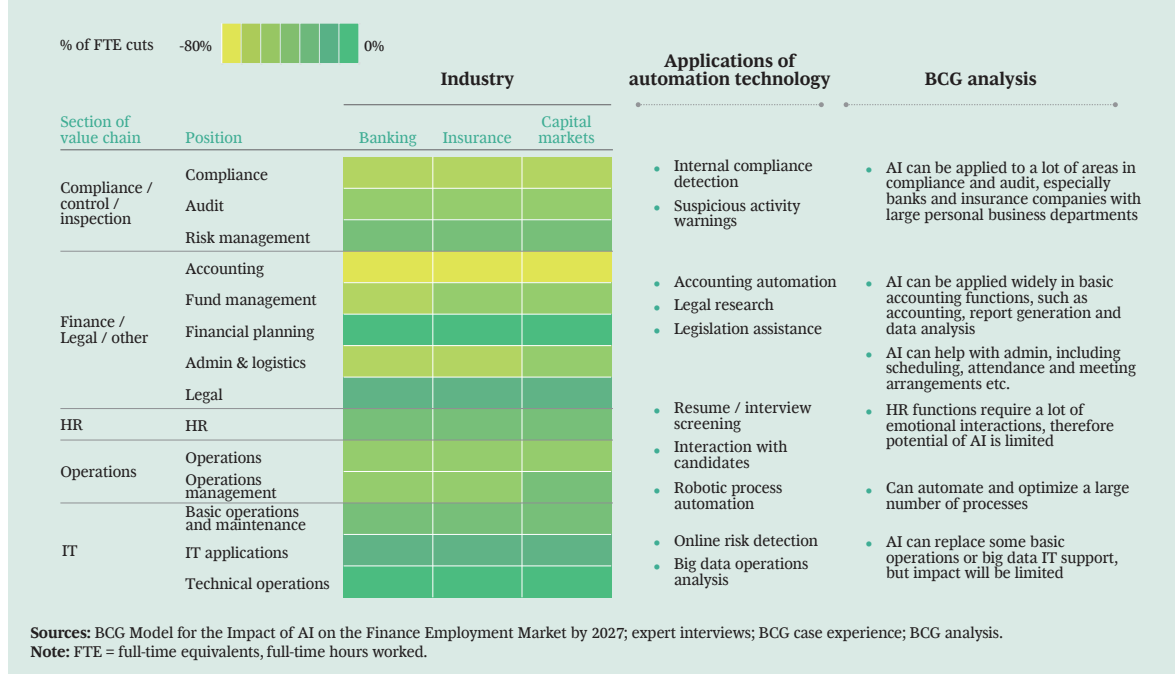
In China, the impact of AI on domestic capital market is more in improving efficiency and providing investment decision-making support. In the field of artificial investment research and risk appraisal control, Huatai securities has built an intelligent quantitative investment system. It has also developed risk management system independently to help human operators carry out effective risk diversification, avoidance and control. Industrial Securities' Research Management Platform can carry out automatic data filtering and model calculation, and can generate some research reports automatically. At the same time, Industrial Securities built a public opinion monitoring system in collaboration with universities, to provide an important reference and decision-making assistance for industry research.

### 3.2.4 Impact of AI on Employment in Supporting Functional Departments in the Financial Industry

AI will have an even larger impact on supporting departments in the financial industry.



## Exhibit 14. Heat Map of FTE Cuts in Financial Support Functions



(See Exhibit 14.) We estimate that by 2027, AI will eliminate 390,000 jobs in supporting functional departments, accounting for 17% of the total jobs cut, and improving the efficiency of the remaining jobs by 45%.

In terms of positions, AI will reduce and enhance the efficiency of the jobs in compliance, customer service, accounting, audit, admin and logistics. Automated accounting systems can be widely used to carry out basic functional work, such as bookkeeping, report generation and data analysis. In admin and logistics, automatic scheduling systems can assist in office work, and even predict future working hours. AI also plays a role in compliance, for example in internal compliance detection, it can act as an early warning function for suspicious activities, which will have a major impact on the banking and insurance industries, as they have a lot of personal business. In human resources, AI can also help screen resumes/interviews, as well as identify and anticipate the character and behavior of candidates. However, since HR requires responses to emotions, the potential for applying AI is limited.

The above analysis of the application of artificial intelligence in the financial industry and its impact on employment are based on the assumption that AI will develop steadily in the next decade. However, we should also consider that, the development of AI technol-

ogy, and its widespread application in the financial industry over the next decade will be limited and affected by multiple factors, such as **technology, regulation and talent**.

On a technical level, AI needs to carry out calculations and process massive amounts of data. Therefore, if the calculation capability of the relevant data accumulation or the hardware does not meet the requirements of the practical application, its development may be limited. If the financial industry has not emphasized the accumulation and storage of data standard in some fields, it may take a long time to collect enough data to meet practical AI requirements.

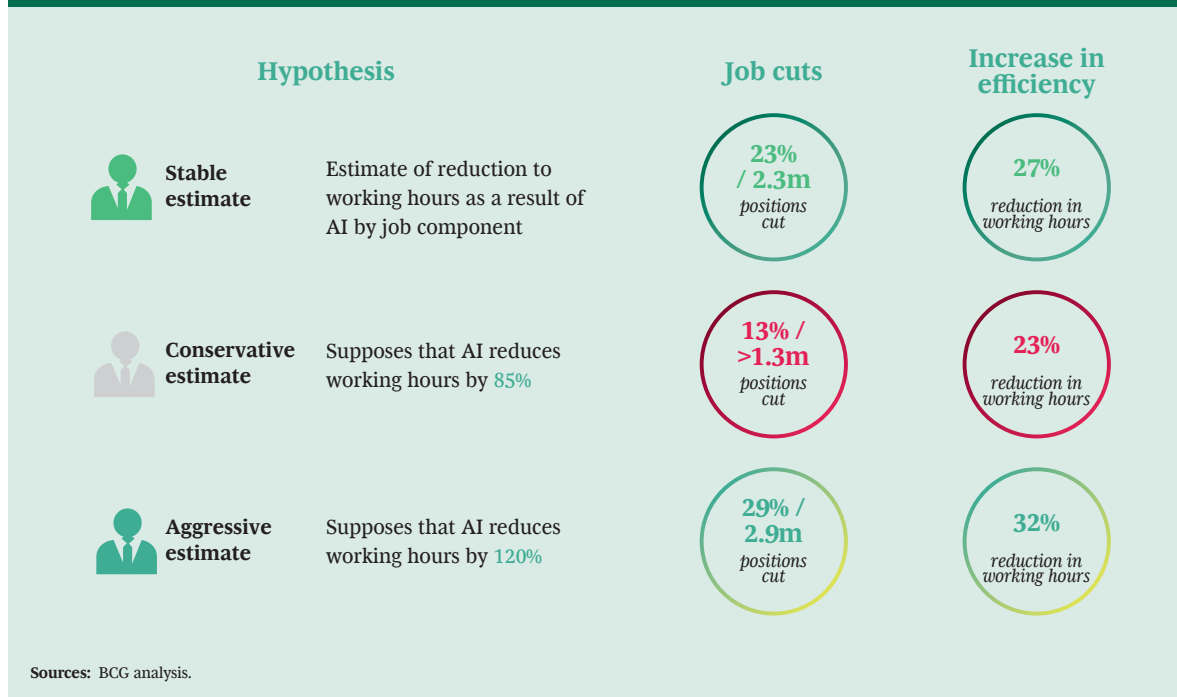
In terms of regulation, since AI can lead to potential security, privacy or financial risks, so as AI applications become more popular in the financial industry they may be subject to stricter regulations. For example, regulations may limit AI to solve the issue of security breaches and protect personal data. In addition, since decision-making in AI is based on data learning, the logic of its model is still difficult to explain. The characteristics of the financial industry may mean that models need to be explained to a certain extent for regulatory purposes, which will limit the applications of AI. In view of this uncertainty, and the characteristics of China's financial regulation, certain AI technologies that have been applied abroad may not be approved in China, or may have to undergo a trial period. Therefore, the popularization of AI in the financial industry may be slower than expected.

Quality talent is essential for the development of AI in the financial industry. However, China's existing AI talent is still relatively weak, and not able to meet the huge market demand. This is particularly true of university graduates in AI. AI talents in China still lack the knowledge and the ability to innovate that top talents in foreign countries possess. Some of the top talent is flowing to the US. In addition, financial institutions are finding it difficult to recruit top AI experts — the talent is still concentrated in Internet companies. Many financial firms are not able to research and develop AI solutions independently. If China fails to cultivate and attract AI talents over the next decade, the popularization of AI applications in the country may be limited.

Given the potential constraints outlined above, we have considered three different scenarios of the impact of AI on employment in the financial industry. (See Exhibit 15.) Based on the stable estimate mentioned above, we also added **conservative** and **aggressive** estimates.<sup>9</sup> In terms of job cuts, in the steady scenario, the application of AI in the financial industry will cut about 2.3 million jobs (23%), while the number of job cuts in the

<sup>9</sup> Assuming that, in the conservative estimate, AI can help to save 85% of the working time in the stable estimate. In the aggressive estimate, we assume that the reduction in the number of working hours due to AI will be 120% of the number in the stable estimate.

## Exhibit 15. Analysis of the Impact of AI on Employment in the Financial Sector



conservative estimate is 1.3 million people (13%), and the number in the radical estimate is up to 2.9 million people (29%). In terms of increases in efficiency, in the stable estimate, AI will reduce working hours in the financial sector by 27%, while the conservative estimate is 23%, and the aggressive estimate is 32%.

## 4. Changes in the Employment Structure in the AI Era: Shifting Demand Structure, Diverse Skill Requirements

### 4.1 Changes of Employment Demand Structure in the New Wave of AI

The changes of employment demand and talent requirements in the AI era have been more evident in developed countries and leading companies. Taking the United States as an example, the technological changes over the past few decades, particularly the rapid growth of computer processing speed and capabilities and automation of everyday tasks, have resulted in a decrease in the time spent on manual and cognitive tasks, especially by production line workers, operations, and office clerks. At the same time, demand has continued to grow for professional service talents with an emphasis on communications, logic and creation, and technical talents dealing with computer technologies.

Focusing on leading international companies, Goldman Sachs' talent requirements have changed significantly due to the influence of AI. The company has increased the size of its quantitative team in the Institutional Client Securities Department from 18% in 2012 to 27%, and has also "upgraded" its talent requirements: 10 to 15 years ago, it simply needed analysts with risk modeling and pricing abilities, but now it is focusing more on employing people with skills in AI, such as data analysis and machine learning. In October 2017, Goldman Sachs even established an elite high-tech AI R&D team at the group level. The project team communicates with different departments and regions to develop optimal technical solutions to support long-term business development.

In China today we have also observed similar changes in employment demand and talent requirements. In the wave of technological progress, posts relying on creativity and communications will continue to grow, for example healthcare professional, senior corporate decision-makers, education personnel (particularly in children's education), creative work (including artists and performers), architects as well as manual work and services in complex environments. By contrast, low-skill positions in China have become untenable due to the impact of new technologies; for instance there has been negative growth in employment of data entry clerks, stenographers, secretaries, customer service representatives and other positions in recent years.

At present, AI technology in China is still in an introductory stage, therefore the changes of employment demand in the AI field are limited, and is mainly reflected in a demand for basic technical talents. From a recruitment perspective, companies are placing greater emphasis on technical skills, particularly basic AI skills technical ability. According to the

big data from Zhaopin, growth in employment demand over the past year has been largest in two skill areas: talents with skills in specific AI technologies, such as machine learning, computer vision and NLP, and talents with skills such as data mining, data storage, data analysis, and database architectures. Despite the large demand, there is an acute shortage of talents with AI experience. Some candidates from the IT fields have more work experience, they have limited real experience of AI. Chinese companies still have a long way to go in nurturing, attracting and retaining AI talents.

## 4.2 Trends in Talent Requirements in the AI Age

As AI technology develops, the demands for talents are also changing. AI is gradually replacing manual labor in repetitive, highly standardized job activities that can be carried out using computer software, therefore demand for these positions has been in decline. However, there are some positions that will not be replaced AI over the next decade. According to a survey of 352 AI scientists at Oxford University and Yale University, AI will not replace human labor completely for another hundred or 200 years. In particular, jobs with high communications, logic and creative requirements will not be replaced by AI in the near future. Looking back over history, each technological advance has created new employment demands while replacing certain jobs. For example, technical personnel, as the mainstay of the technological revolution, will be a key long-term growth area in job markets. At the same time, changes in employment demand will raise new requirements for talent training and capabilities.

The first change will be an increased demand for talents skilled in AI technologies, and with soft skills, **both on a technical and application level**. After AI technology develops to a certain extent, companies may have higher demands for talents in higher-level technologies such as robot training and supervision, robot exterior design and personality design. Such top technical talents often have a strong academic background and scientific research capabilities. Most of them have a doctoral degree in Computer Science, Electrical Engineering, or another professional science disciplines. For technology applications, companies will need to find generalists with both **technical and soft skills**. Such talents need to have an interdisciplinary background and all-round abilities. For example, they need to have both programming skills and the ability to build a business model. They also need to be able to understand business logic, and cooperate with different parties across disciplines to understand the applications of AI in different industries.

In addition to generating demand for talents, AI will also affect the overall labor market. Activities that can be replaced by artificial intelligence are those that can be automat-

ed. In the past, mechanization replaced repetitive manual work. Most of the positions replaced were low-paid jobs. However, as technology evolves, AI may also be able to replace some of the most well-paid jobs that are not highly mechanical, but mainly rely on historical experience and judgment, for example, doctors and lawyers. The other jobs that cannot be replaced rely more on communications and creativity. Jerry Kaplan, author of “Humans Need Not Apply: A Guide to Wealth and Work in the Age of Artificial Intelligence” said that it is more difficult for machines to replace workers who understand how to communicate face by face, can comprehend by analogy, and find opportunities at the intersection of jobs. These occupational skill requirements challenge existing education and vocational training system.” From this point of view, developments in AI will amplify the soft skills of talented people and make them applicable to a broader range of industries. It will also increase requirements for talents’ **creativity, emotional communications, and complex problem solving.**

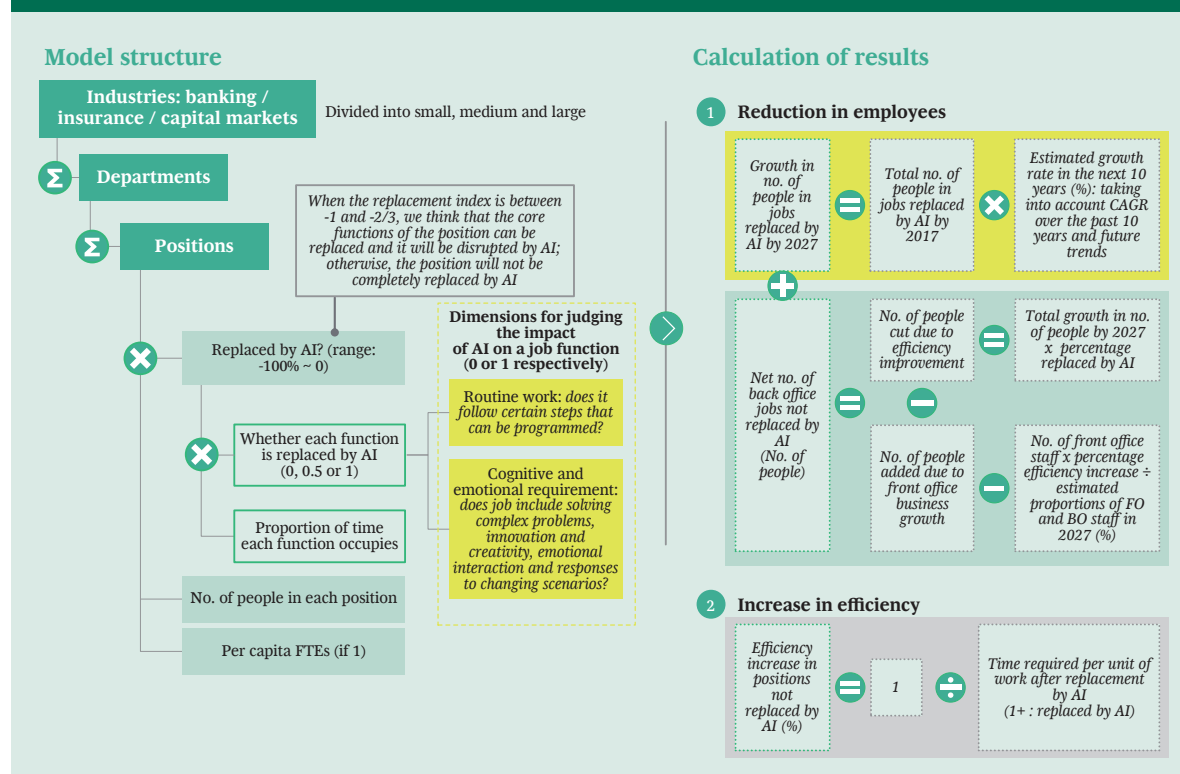
In summary, although the advent of the AI age creates a “struggle” between humans and machines and replaces jobs, it also creates opportunities for new talents who can create, apply and optimize the AI technologies. It also requires workers with strong communications abilities who can apply their high-level technical achievements to production and daily life.

## Appendix

The BCG Model for the Impact of AI on the Financial Job Market by 2027 is based on the actual situation in Chinese market. It covers more than 400 functions in more than 100 positions across banking, insurance and capital markets. Based on the input from industry experts, the model is used to judge each function to determine whether it can be replaced by AI, and then derive the number of people replaced and the increase in efficiency in the financial employment market by 2027 under the impact of AI. (See Exhibit 16.)

The model breaks down the employment market in the financial sector into industries, small, medium and large-sized enterprises, departments and positions. Each post is further divided into three to five major functional areas. Two dimensions are used to judge whether each functional area can be replaced by AI: the level of non-standardized work in the functional area — whether or not it is possible to follow certain steps that can be programmed and simulated by a model — and the level of cognition and emotional decision-making required: whether the function needs to address complex issues, whether it requires innovation and creation, emotional interactions or responses to a random,

**Exhibit 16. BCG Model for the Impact of AI on the Financial Job Market by 2027**





rapidly changing environment. If the function requires both dimensions, then it will not be replaced in the near future. If it does not require either, then it can be replaced by AI. If it requires one dimension but not the other, then AI can help a human worker to carry out the function to a certain extent.

As mentioned above, we have outlined three areas in which AI will affect the financial employment market — job cuts, increases in efficiency, and job creation. The BCG Model for the Impact of AI on the Financial Job Market by 2027 focuses on calculating the impact of the first two types. The number of job cuts includes jobs where the major core functions have been replaced by AI and jobs that have not been replaced but that AI has made more efficient. The estimate for the remaining jobs is based on the reduction in working hours and the increase in efficiency.



## For Further Reading

Other recent BCG publications:

**The Build-or-Buy Dilemma in AI**

A focus by The Boston Consulting Group,  
January 2018

**3 Steps to Building a Data-Driven Company**

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