

HEPHAESTUS AND TALOS: THE LEGAL STATUS AND OBLIGATION THEORY OF ROBOT ADVISORS

SIMIN GAO*

In the context of intelligent finance, the traditional legal framework targeting financial professionals is impractical and ineffective for robo-advisors do not possess independent legal personality, thereby leading to problems of empty enforcement, confusion concerning the identity of obligors and the failure of the existing system of duties. To deal with this dilemma, lawmakers need to restructure the obligor's identification mechanism and the system of duties. The substance of duties for the mode of robo-advisor needs to penetrate the complex veil and keep up with the algorithmic level to reflect their essential characteristics. The principles for the new regulatory paradigm are to avoid the evasion of accountabilities and responsibilities caused by dodging and relaxing the duties with the excuse of algorithm black box, as well as to avoid overburdening obligors by fully embracing the new development of artificial intelligence.

I. INTRODUCTION

Artificial intelligence (“AI”) is not an innovation of the 20th century. In ancient times, the God of blacksmith and fire in Greek mythology, Hephaestus, created the first intelligent robot, Talos, which was given to Europa.¹ Talos was a gigantic bronze device, with a certain degree of automaticity and intelligence and functioned to protect the Crez.² Was Talos a person in law? Who should be responsible for Talos' behaviours? Should it be the creator Hephaestus or the owner Europa? The birth of the intelligent robot raised the debate over the concept of a ‘legal person’ and the associated issue of liability in law. The debate continues and grows ever more heated as intelligent robots emerge from mythology into reality in different industries. This paper is about the long-standing controversies in the financial industry in the age of intelligent finance, which uses intelligent technology to provide financial services.³ In the age of intelligent finance, the development of technology enables some technology platforms

* Dr. Simin Gao is an Associate Professor of Tsinghua University, School of Law. She got her S.J.D degree from University of Pennsylvania in 2013.

¹ See *The Automaton Talos in Greek Mythology*, online: Greek Legends and Myths <<https://www.greeklegendsandmyths.com/talos.html>>.

² See S Hussain Ather, *Antiquity*, online: A History of Artificial Intelligence <<https://ahistoryofai.com/antiquity/>>.

³ The concept of intelligent finance is raised in financial literature. For example, Heping Pan, Didier Sornette & Kenneth Kortanek, “Intelligent finance—an emerging direction” (2006) 6 *Quantitative Finance* 273 at 273; Feldman Konrad & Treleaven Philip, “Intelligent systems in finance” (1994) 1 *Applied Mathematical Finance* 195 at 195-207.

to replace professional financial intermediaries in financial activities⁴ (for example, the digital financial intermediaries, typically P2P platforms and crowdfunding). AI assisting natural persons to engage in financial industry data analysis, processing and services is known as an intelligent financial agent.⁵ Intelligent finance poses a huge challenge to regulation. The focus of traditional financial law and regulation is based on financial institutions and financial practitioners, while non-financial institutions and their employees are outside its radar. Thus, traditional regulation is insufficient to deal with intelligent finance,⁶ which may bring about the problem of liability failure leading to the externalisation of risk.⁷ Robot advisors are a typical form of intelligent financial agents. Robot advisors replacing natural persons to advise investors brings challenges to the traditional financial regulation, which targets the financial practitioners. If a robot advisor does not have an independent legal personality, who should be the fiduciary in the client-advisor relationship? Who should be liable for the loss of investors caused by using AI in financial services? Should the legal obligations be different under the robot advisor model? This paper aims to answer these questions in the context of Chinese law. Although this paper takes robot advisors as an example and uses Chinese law as the context, it may provide a reference to the fundamental questions that the financial industry may face when using AI, namely, the problem of obligor identification and reform of the obligation system to better accommodate the algorithmic context. This article can also shed light on the long-standing debate over the concept of the 'legal person' and the liability system in the context of AI.

II. THE GAME OF INTELLIGENT FINANCE AND LAW: THE STATUS AND DILEMMA

The two primary challenges faced by the financial industry are finding new profitable sources and cutting costs. Firstly, finance is a heavily regulated industry with high compliance costs. Therefore, the industry needs to seek new profitable businesses through innovation, which does not have much compliance burden. Using intelligent technology in financial services can help to solve these two challenges. Using an intelligent tool to replace heavily regulated financial professionals to provide services enables the complex financial services to be hidden behind the veil of technology so that regulators cannot fully understand the risks of the business and may deregulate the innovative service. From this point of view, intelligent finance has a gene for regulation arbitrage. Secondly, the complexity and depth of expertise of the financial industry makes the cost of its human resources high, therefore excluding consumers

⁴ See Gregory Scopino, "Preparing Financial Regulation for the Second Machine Age: The Need for Oversight of Digital Intermediaries in the Futures Markets" (2015) *Colum Bus L Rev* 439 at 510 [Scopino].

⁵ See Samir Chopra & Laurence F White, *A Legal Theory for Autonomous Artificial Agents* (Ann Arbor: University of Michigan Press, 2013) [Chopra].

⁶ See Douglas W Arner, Janos Barberis & Ross P Buckley, "The Evolution of FinTech: A New Post-Crisis Paradigm?" (2016) 47 *Georgetown Journal of International Law* 1271 at 1289 [Arner].

⁷ "Responsibility failure is caused by a firm's ability to externalize a significant portion of the costs of taking a risky action." See Steven L Schwarcz, "Regulating Shadows: Financial Regulation and Responsibility Failure" (2013) 70 *Wash & Lee L Rev* 1781 at 1811.

with lower income from getting financial services. AI can reduce labour cost and service price, and hence promote the financial inclusion of the lower-income class. In the past decades, the history of intelligent finance has also been the history of a game of innovation and regulation. This game is about how the law can balance the two extremes: the benefits and risks of innovation. Today, as we discuss how to regulate intelligent finance, the lessons of history are still relevant.

A. *Fifty Years of Development, Gameplay and Lessons from Intelligent Finance*

Intelligent finance is not new; it dates back to 1967 when Barclays used the world's first ATM.⁸ In 1978, the modern automatic interbank clearing system was established in the UK. Established in 1973, the Global Banking Financial Telecommunications Association provides financial institutions with a set of standards for the exchange of information and payment data, allowing electronic transaction instructions to gradually replace manual instructions.⁹ This set of systems made transaction instructions completely electronic and transnational. However, high-speed and wide net trading meant increased efficiency as well as increased risk. The collapse of Herstatt Bank in the 1970s brought attention to the systemic risks of cross-border finance, which led to the birth of the Basel Committee, an international regulator.¹⁰ The progress of intelligent finance did not stagnate. In 1971, the United States ("US") established a national securities electronic market system, the Nasdaq Stock Exchange.¹¹ In the 1980s, the computerised risk internal control system was developed by Bloomberg, a technology company, and widely used by financial institutions.¹² Soon after that, the automated trading procedures emerged.¹³ The automated trading system led to the 1987 global Black Monday stock market crash, after which regulators placed heavy regulation on the electronic stock market to control the speed of price changes.¹⁴ In the 1990s, the universal use of computer technology enabled individual investors to participate in financial investment via intelligent financial platforms, which used to be only available to financial professionals.¹⁵ Unfortunately, the boom of overinvestment led to a speculative bubble. The burst of the internet bubble in 2000 made the users of intelligent financial platforms switch from non-professionals to financial professionals again.¹⁶ The development of intelligent finance in the past 50 years has given today's lawmakers and regulators many lessons on how we can encourage technological innovation as well as avoid the risks and externalities of FinTech. The following risks cannot be ignored.

⁸ See Brian Welch, *Electronic Banking and Treasury Security* (Sawston: Woodhead Publishing, 1999).

⁹ See Paolo Sironi, *FinTech Innovation: From Robo-Advisors to Goal Based Investing and Gamification* (Chichester: Wiley, 2016) at 125 [Sironi].

¹⁰ See Arner, *supra* note 6 at 1286.

¹¹ *Ibid.*

¹² See Sironi, *supra* note 9.

¹³ *Ibid.*

¹⁴ See Arner, *supra* note 6 at 1286.

¹⁵ See Sironi, *supra* note 9.

¹⁶ *Ibid.*

1. *Too fast to save*

The combination of finance and technology can lead to greater efficiency, but there is also a risk of “too fast to save”.¹⁷ Professor Lin has claimed that “the future of cy-fi only appears to be accelerating as financial engineers chase the speed of light with new technology like quantum computing. Such velocity and acceleration give rise to a new systemic risk of ‘too fast to save’.”¹⁸ Particularly, “[a]utomated programmes responding to bad data or nefarious stimuli can cause catastrophic harm to financial institutions before remedial or rescue measures can be implemented”.¹⁹ Law and regulation often lag behind the development of technology. Under the pressure of the industry to encourage innovation, law and regulation often tolerate a trial-and-error approach and deregulate innovation. It is often too late for law and regulation to step in after the risks associated with innovation quickly accumulate and turn into a disaster.

2. *Speculative bubbles caused by low threshold of investment*

The combination of finance and technology greatly reduces transaction costs, meaning that both professional institutions and non-professionals can obtain convenient and cheap transaction assistance. This breaks down barriers for non-professionals investing without professional institutions. However, this also means that more capital flows into the financial sector because of the lower entry threshold, irrational investment frenzy and bubble.

3. *Regulatory dilemmas caused by infinite intermediaries*

The development of technology has made the boundaries of financial institutions more and more blurred. Many institutions are in the middle zone between the categories of financial institutions and technology institutions. The connection between technology institutions and financial institutions intensifies over time. This phenomenon is known as infinite intermediary phenomenon according to the literature.²⁰ The emergence of infinite intermediaries in FinTech makes it difficult for traditional regulation to effectively regulate the FinTech kingdom. Thus, there is a significant risk of regulatory failure and regulatory arbitrage.

History shows the lesson that technology providing faster and cheaper financial services does not change the high-risk nature of financial activity. Financial investment is not universally suitable for everyone. In the absence of an effective regulatory and responsibility system, rashly promoting the use of intelligent financial platforms instead of financial professionals to the public will undoubtedly trigger a crisis.

¹⁷ Tom C W Lin, “The New Financial Industry” (2014) 65 Ala L Rev 567 at 588 [Lin, “The New Financial Industry”].

¹⁸ *Ibid.*

¹⁹ *Ibid* at 589.

²⁰ Tom C W Lin, “Infinite Financial Intermediation” (2015) 50 Wake Forest L Rev 643 [Lin, “Infinite Financial Intermediation”].

B. *The Characteristics of Robot Advisors*

Robot advisors possess a certain degree of intelligence; they are able to independently perform certain behaviours and tasks without direct human intervention and interact with humans or other intelligent intermediaries. They are able to react autonomously to circumstantial changes and execute instructions without intervention by human beings or other actors. They could be trained to learn social skills to communicate with other artificial intermediaries or humans. They have the ability to proactively carry out goal-oriented activities. They can react and observe the communication environment. They have the ability to act like a human or other intermediaries for certain acts. Three fundamental characteristics, namely responsiveness, mobility and representativeness, allow robot advisors to demonstrate characteristics similar to human agents.²¹ However, smart investment advisors are not conscious agents. According to Davidson's definition, the legal conduct of so-called conscious agents must be based on their beliefs or wishes, not on human instructions.²² Michael Jordan said that the evolution of AI has not yet begun and the current stage of development of AI only serves to increase human intelligence and is far from creating independent intelligence.²³ The current stage of AI is still far from real intelligence and it is actually better described as "intelligence augmentation", which creates "services that augment human intelligence and creativity".²⁴

C. *The Regulatory Dilemma of Robot Advisors*

Robot advisors have changed the legal relationship between an advisor and his client. Natural person investment advisors do business face-to-face with investors whereas robot advisors interact with clients via their AI system instead of face-to-face interaction. Investment advisors provide investment services after they learn about the demands of their investors. Their advice is customised and personalised to the clients' needs. Under the robot advisor mode, consulting behaviour is pre-set in the algorithm by the programme design and the development institution. A significant difference from the traditional model is that algorithm replaces natural persons to contact the investor and complete the consultation. The series of relationships under the robot advisor is shown in Fig. 1. The legal relationship at the service providing stage, (for instance, the contractual relationship between the investors and the financial institution) is shown inside the block with the solid line frame. The legal system which was originally designed to regulate financial practitioners faces the difficulties of application in the robot advisor model. Therefore, how to reconstruct the law and regulation in the context of robot advisors is the first question to be answered in this paper. The block with the dashed line frame shows the legal relationship at the programming stage, which is a core part of the business of the robot advisor

²¹ Chopra, *supra* note 5 at 10.

²² See Donald Davidson, "Agency" in Robert W Binkley, Richard N Bronaugh & Ausonio Marras, eds. *Agent, Action, and Reason* (Toronto: University of Toronto Press, 1971) at 3-25.

²³ See Michael I Jordan, *Artificial Intelligence: The Revolution Hasn't Happened Yet*, online: Medium <<https://medium.com/@mijordan3/artificial-intelligence-the-revolution-hasnt-happened-yet-5e1d5812e1e7>> [Jordan].

²⁴ *Ibid.*

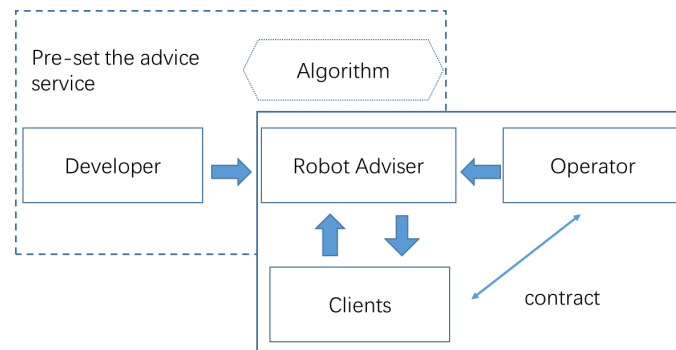


Fig. 1. Legal Relationships in The Robot Advisor Mode.

but lacks legal regulation at present. The robot advisors' programmes are generally developed by the technology department of third-party institutions or financial institutions. The core of their programme is the algorithm that reflects the characteristics of customers and products. The consulting and investment services are pre-set in the algorithm,²⁵ which is regarded as a technical activity and out of the reach of the traditional regulatory framework. The degree of intelligence in the pre-set algorithm for robo-advisors varies to a great extent. Some simply have the options menu without a questionnaire of the client's characteristics; some have the matching function, which matches the clients' merits and demands with certain financial products; some provide independent advice for the clients, which are similar to robo-advisors in the US, such as those deployed by Wealthfront and Betterman.²⁶ How can regulators regulate pre-set consulting and investment services by algorithm? There is no ready answer. This is the second question to be answered in this article.

The development of intelligent finance has led to two regulatory dilemmas. Firstly, FinTech weaves a seemingly convenient and transparent veil of technology but hides complex financial intermediaries and legal relations involving algorithm behind the veil.²⁷ It is difficult for regulators to understand the nature and risk of financial behaviour behind the veil of technology, leading to the failure of external regulation. As Lin argues, "the swiftness of financial innovation simply laps the slowness of rule-making" and the lack of investment in RegTech compared with the huge investment in the industry will exacerbate the lags.²⁸ AI algorithms involving the technology of neural networks based on thousands of variables and millions of pages of data are more complex than traditional computer programmes. Thus, it is difficult for regulators to determine the specific data related to the results. Robot advisors often use large amounts of data to make decisions by consolidating data across platforms, which also makes it difficult for regulators to explain specific factors that influence

²⁵ "An algorithm is a set of instructions for how a computer should accomplish a particular task... combining calculation, processing, and reasoning." See Robyn Caplan *et al*, *Algorithmic Accountability: A Primer*, online: Data & Society <https://datasociety.net/wp-content/uploads/2018/04/Data_Society_Algorithmic_Accountability_Primer_FINAL-4.pdf> [Caplan].

²⁶ See Accenture, *Robo-advisor in China*, online: Accenture <https://www.accenture.com/_acnmedia/D5D04FA6325249E196F3BB2C519B1134>.

²⁷ Lin, "Infinite Financial Intermediation", *supra* note 20 at 657.

²⁸ Lin, "The New Financial Industry", *supra* note 17 at 593-594.

algorithmic behaviour and finally identify the responsible parties. The emergence of robot advisors further blurs the boundaries of financial institutions and technical institutions, resulting in the phenomenon of infinite intermediaries.²⁹ Regulators are faced with the difficulty of identifying the nature of financial behaviour and responsible persons.³⁰

Secondly, intelligent technology binds users to a narrow area of information led by interests and preconceptions, thus creating an information cocoon.³¹ Intelligent finance gives a sense of neutrality and the appearance of algorithmic science easily misleads investors into making the wrong decisions. This also makes investor protection issues more prominent in the context of intelligent finance. Algorithms are only a decision-making device to augment human intelligence. Algorithms cannot transcend the human bias of their designers as “an opinion wrapped in the appearance of mathematics”.³² Although intelligent financial technology can “augment human intelligence and creativity, many of the moral and capable flaws of human beings remain”.³³ Designers and operators are not necessarily able to overcome their moral and capable deficiencies. Those deficiencies may be hidden behind the algorithm, less likely to be found by regulators and the public. A new model is needed for dealing with the problems created by using algorithms in finance.

III. THE CHALLENGE OF THE ROBOT ADVISORY MODEL TO THE TRADITIONAL REGULATORY SYSTEM

As financial products become increasingly complex and information asymmetries become increasingly prominent, investors’ negotiation ability, decision-making ability and ability to resist risks increasingly become too weak to effectively monitor the behaviour of financial practitioners. Therefore, investors need special protection. Under the natural person investment advisor model, natural person investment advisors and financial institutions are fiduciaries undertaking fiduciary duties and compliance obligations such as obtaining permission, registering according to law and maintaining competence and suitability obligations under Chinese law.³⁴ Chinese law also establishes a structure of effective supervision of investment advisors inside financial institutions.³⁵ The emergence of robot advisors has made financial behaviour a mixed process, consisting of both human behaviours as well as algorithmic behaviour.

A. *The Traditional Regulation for the Natural Human Advisor*

This mixture of actions by machines and human beings makes it difficult to identify responsible persons and allocate responsibility. Under the traditional investment

²⁹ *Ibid.*

³⁰ See Caplan, *supra* note 25 at 3.

³¹ Cass R Sunstein, *Infotopia: How Many Minds Produce Knowledge* (Oxford: Oxford University Press, 2006).

³² See Caplan, *supra* note 25 at 3.

³³ Jordan, *supra* note 23.

³⁴ See *eg, infra* note 47 and 48.

³⁵ See *eg, infra* note 46.

advisory model, the advisors who provide advice to investors owe a fiduciary duty to the investors. Although investment decisions are based on the Modern Portfolio Theory as a standard practice,³⁶ investment advice is diversified and personalised by relying on very personalised factors, such as experience, knowledge, talent, implicit intuition and logical reasoning, which form the basis of the professional judgment of advisors and determine the quality of advice. In addition to the different quality of professional judgment, professional ethics determine the behaviour of advisors, especially in the circumstance of a conflict of interest. Though as important as they are, these factors are unpredictable *ex ante*, hence constituting risks difficult to control with contracts.

Fiduciary duty is the legal response to uncontrollable and unpredictable risks and uses *ex post* penalties to deter wrongful conduct amongst fiduciaries. The regulation issued by the Chinese Securities Regulatory Commission provides for a duty of prudence and loyalty from investment advisors.³⁷

The duty of loyalty is a core fiduciary duty.³⁸ The duty of loyalty requires that the fiduciary's conduct must be in good faith and for the interests of the beneficiary. The fiduciary must also avoid self-dealing and disclose any conflict of interest.³⁹ The investment advisor has personal interests, which may conflict with the fundamental interests of the investor. The duty of loyalty sets the standard for investment advisors in the face of conflicts of interest. In accordance with the requirements of the duty of loyalty, the clients' interests must override the investment advisors' interests. Investment advisors shall not recommend products that are not in the best interest of the investor, even if it is in the interests of their employers (financial institutions) to promote the products. The duty of loyalty also requires that the investment advisor shall not disclose the secrets of any client for the benefit of any other client.⁴⁰

The duty of care requires the fiduciary to act as a prudent investment advisor in any given circumstance and to have reasonable care, skill and vigilance necessary to fulfil his or her obligations.⁴¹ The duty of care is more about the attitude of consultants than the outcome of their work. If they act in accordance with general practice in the process of engagement, they are not responsible for investment failures.⁴²

Financial institutions' fiduciary obligations have two significant characteristics. Firstly, financial institutions should, through internal control and management, ensure that their investment advisors are able to provide services in compliance with practical and prudent obligations. Financial institutions should also have a sound internal control mechanism to form an effective system of constraints.⁴³ Senior managers and sub-management managers also have a duty of loyalty to their financial

³⁶ See Richard A Brealey, Stewart C Myers & Franklin Allen, *Principles of Corporate Finance*, 10th ed (New York: McGraw-Hill/Irwin, 2008).

³⁷ See China Securities Regulatory Commission, *Interim Regulations on Securities Investment Advisors* (2010), arts 4-5 [*Interim Regulations*].

³⁸ See *Uniform Prudent Investor Act* (1995), s 5.

³⁹ *Ibid.*

⁴⁰ See *Interim Regulations*, *supra* note 37, art 20 (which states that the advisor shall not disclose any secret information of his/her clients to any other person).

⁴¹ *Restatement of the Law Third, Trusts*, s 77 [*Restatement*]; *Uniform Trust Code*, s 804.

⁴² Peizhong Gan & Chun Zhou, "The Study of Fiduciary Duty of the Security Investor Advisor [Zhengquan Touzi Guwen Shouxin Yiwu Yanjiu]" (2012) 10 *Journal of Law Application* 37.

⁴³ Steven L Schwarcz, "Conflicts and Financial Collapse: The Problem of Secondary-Management Agency Costs" (2009) 26 *Yale J on Reg* 457 at 458-459.

institutions.⁴⁴ Secondly, financial institutions have more funding compared with individuals to compensate investors for losses. A financial institution needs to compensate an investor's loss when its employee violates his fiduciary duty under Chinese law.⁴⁵

Due to the significant depth of expertise and systematic risk involved in financial businesses, the financial industry strictly implements the licensing system. Firstly, institutions and individuals who engage in the financial industry must be approved by the relevant authorities. Otherwise, those would constitute illegal financial operations. Investment advice is also included.⁴⁶ Secondly, natural person investment advisors need to pass a qualification exam and obtain a special license to ensure their competence.⁴⁷ Although the senior managers, directors and supervisors of financial institutions do not have direct contact with investors or provide advice directly, they exercise substantial supervision and influence over direct practitioners and manage the day-to-day affairs of financial institutions. Therefore, Chinese law also requires them to get qualified to testify to their competence.⁴⁸

Due to the complexity of financial products and the heterogeneity of investors, it is necessary to require investment advisors to sell the right products to the right investors under the suitability obligation. An advisor should not recommend high-risk products to investors without the corresponding risk appetite. The obligation of suitability aims to ensure that investment advisors sell qualified products to suitable investors with adequate financial resources to take risks.⁴⁹ The obligation of suitability should be fulfilled by financial institutions and their practitioners who have a duty of loyalty to their investors. However, traditional regulation regarding investment advisors is targeted at regulating human investment advisors and financial institutions and faces new challenges in the context of robot advisors.

⁴⁴ *Interim Regulations*, *supra* note 37, arts 3 and 9.

⁴⁵ See *Tort Law of the People's Republic of China* (2010), art 34 [*PRC Tort Law*]:

"Where an employee of an employer which is an entity causes any harm to another person in the execution of his work duty, the employer shall assume the tort liability. Where, during the period of labor dispatch, a dispatched employee causes any harm to another person in the execution of his work duty, the entity employer receiving the dispatched employee shall assume the tort liability; and the entity employer dispatching the employee, if at fault, shall assume the corresponding complementary liability."

See *Securities Law of the People's Republic of China* (2014), art 171 [*PRC Securities Law*]:

"An investment consulting institution as well as its practitioners that engage in securities trading services shall not have any of the following acts: (1) Engaging in any securities investment as an agent on behalf of its entrusting party; (2) Concluding any agreement with any entrusting party on sharing the gains of securities investment or bearing the loss of securities investment; (3) Purchasing or selling any stock of a listed company, for which the consulting institution provides services; (4) Providing or disseminating any false or misleading information to investors through media or by any other means; or (5) Having any other act as prohibited by any law or administrative regulation. Any institution or person that has any of the acts as prescribed in the preceding paragraph herein and thus incurs any loss to investors shall bear the liabilities of compensation."

⁴⁶ *PRC Securities Law*, *ibid*, art 169:

"Where an investment consulting institution, financial advising institution, credit rating institution, asset appraisal institution, or accounting firm engages in any securities trading service, it shall be subject to the approval of the securities regulatory authority under the State Council and the relevant administrative departments."

⁴⁷ *Interim Regulations*, *supra* note 37, art 7.

⁴⁸ *Ibid*, art 6.

⁴⁹ *Ibid*, art 15.

B. *The Black Box of Robot Advisors and The Obligation Failure*

Robot advisors are essentially intelligent products in place of natural person investment advisors to provide investors with investment advice. The algorithm is formed by two parts: analysis of market data (data-driven learning) on one hand and knowledge from humans on the other hand. The latter is a simulation of the behaviour of natural person investment advisors—their intuition and logical reasoning are transformed into computer programmes. This is the primary basis of the conduct of robot advisors. The characteristics of financial products and users are pre-defined in the algorithm and products are matched with suitable users. Under the robot advisor model, natural persons or machines provide advice based on professional judgment in finance, professional ethics and the measurement of interests. In other words, defects and biases in the professional judgment, professional ethics and measurement of interests of natural persons may be transferred to the algorithm. However, the robot advisor itself does not owe a fiduciary duty because AI lacks legal personality. Nevertheless, the issues of a lack of professional competence and conflicts of interest that are supposedly resolved by fiduciary duties still exist. Moreover, the use of robot advisors worsens and further conceals these problems. First, robot advisors may not be able to meet the duty of good faith.⁵⁰ In the US case of *CFTC v Vartuli*, a seller of financial trading software misled investors into thinking that the software would help them make money automatically.⁵¹ It turned out that the investors who used the software suffered substantial losses in the derivatives market. In the Chinese case of *Huang Tenghui*, the defendant set up a technology company to sell stock speculation software to investors.⁵² To attract investors, the defendant's advertisement made fraudulent statements concerning the profit-making capability of the software, lied about the use of insider information and promised a fictitiously high rate of return. The defendant also lied about the qualifications of the analyst who actually did not have any qualifications in security analysis.⁵³ Consequently, more than 100 investors suffered huge losses from using the software.⁵⁴

Second, in addition to the risk of fraud, it is questionable whether robot advisors can fulfil the duty of loyalty. The common model of robot advisors in China can easily cause conflicts of interest. Many robot advisors are ostensibly investment advisors for neutral buyers but in fact, they are the sale agents of funds. For example, Shanxi Securities Regulatory Bureau gave an investment alert that robot advisor platforms such as *Licai Mofang* and *Licai Natie* are agents helping investment funds to sell their shares.⁵⁵

⁵⁰ US Securities and Exchange Commission, *Investor Alert: Automated Investment Tools*, online: US Securities and Exchange Commission <<https://www.sec.gov/oiea/investor-alerts-bulletins/autolisting-toolshhtml>>.

⁵¹ *CFTC v Vartuli* (2002) 228 F.3d 94 (2d Cir) at 99-100.

⁵² The Intermediate People's Court of Yichang, Hubei, *Criminal Judgment*, No (2015) J 00032 M C No 1.

⁵³ *Ibid.*

⁵⁴ *Ibid.*

⁵⁵ Shanxi Office of the China Securities Regulatory Commission, *Investor Protection Month: China Securities Regulatory Commission Cracking Down upon Robo-Advisor Investment Fund Suspected of Irregularities*, online: China Securities Regulatory Commission <http://www.csrc.gov.cn/pub/shanxi/xxfw/tzssyd/jczs/201704/t20170413_315054.htm>.

Robot advisors may not comply with the obligation of being prudent, which is required of human advisors. Under the traditional service model, financial professionals make recommendations based on an in-depth understanding of the needs of investors by asking and gathering information. Robot advisors have significant limitations in gathering information. Their output depends directly on the quantity and quality of information collected from investors. Their information collection is based on questionnaires. Due to the lack of human intuitive thinking, the online questionnaire providing pre-determined options for tools may raise over-generalised, ambiguous and even misleading questions.

Finally, the algorithm of robot advisors is in a black box, making it hard for regulators and investors to verify the fulfilment of compliance obligations. Human advisors need to pass professional training and professional testing, including ethical background checks, in order to obtain professional qualifications and to ensure their continued competence through regular updates of their registration. However, it is still unclear how to test a robot advisor's competence. Under existing regulations in China, the lack of a system to ensure the competence of robot advisors has led to a mix of superior and inferior products in the robot advisor market.

IV. RECONSTRUCTING THE IDENTIFICATION SYSTEM OF OBLIGORS AND THE OBLIGATION SYSTEM FOR ROBOT ADVISORS

To solve the obligation failure of robot advisors, the People's Bank of China, the central bank, in conjunction with other financial industry regulators, issued the *Guidance on Regulating the Asset Management Business of Financial Institutions* on April 27, 2018.⁵⁶ The *PBC Guidance* applies the compliance requirements of competence, suitability obligation and disclosure obligation onto the algorithmic level.⁵⁷ It imposes liability for violation by AI to financial institutions and provides the principle behind regulating robo-advisor businesses as follows:⁵⁸

A financial institution shall use artificial intelligence technology for asset management business in strict conformity with the general provisions of these Opinions concerning the suitability of investors, investment scope, information disclosure, and risk isolation, among others, and shall not use the artificial intelligence business to exaggerate the promotion of asset management products or mislead investors. A financial institution shall file the main parameters of its artificial intelligence model and the main logic of asset allocation with the financial regulatory authority, open separate intelligent management accounts for investors, give full alerts of the inherent defects and usage risks of artificial intelligence algorithms, clarify transaction process, strengthen trace management, and strictly monitor the trading positions, risk limits, transaction types, and price permissions, among

⁵⁶ People's Bank of China, *Guidance on Regulating the Asset Management Business of Financial Institutions (Consultation Paper)* [PBC Guidance] [Asset Management Business Guidance].

⁵⁷ *Ibid.*, art 23.

⁵⁸ *Ibid.*

others, of intelligent management accounts. The financial institution shall, as legally required, be liable for any damage caused to investors by its violation of any law or regulation or improper management.

However, the *PBC Guidance* only provides principles, without pronouncing detailed rules for different processes related to the robot-advisor's design and operation and the obligations system for the different processes. Particularly, it did not distinguish the different forms of design and operation. There is no provision for algorithm design and maintenance processes.

Therefore, the regulation concerning the identification and obligations of robot advisors under Chinese law still needs systematic research and specific rules. This paper proposes detailed suggestions on the identification of obligors and obligations in the context of robot advisors.

A. Identification of Obligors in the Context of Robot Advisors

1. The legal status of robot advisors

The law has granted legal personhood to non-human entities such as companies.⁵⁹ It is also possible for AI to gain legal personhood provided it can become truly independent. However, at the current stage of development, AI does not have independent legal status according to the jurisprudence of the 'legal person'.

Firstly, the current models of intelligent advisors have no sense of independence which is the mark of a separate form of intelligence rather than simply a tool used by humans. Professor Chen and Professor Burgess stated that AI should have the spontaneous capability to have separate legal personhood and would be better described as spontaneous intelligence ("SI"). In these terms, we consider the challenges that may arise where SI as an entity who has no owner, no designer and no controller has evolved into existence as a non-human form of autonomous intelligence. Furthermore, an SI takes no physical form and although it can be present in many places around the world, exists in no particular jurisdiction. Based on this refined notion of SI, we consider issues related to the recognition of such an entity's legal personhood.⁶⁰ Ability to form independent intention is the prerequisite for any legal person to assume responsibility. For example, the court stated in *Hotchkiss* that contractual obligations are legally binding because they represent the "known intent".⁶¹ Some scholars have argued that AI needs to demonstrate free will and assumption of responsibility rather than the fact that it was merely following instructions predetermined by a human.⁶² Only when AI reaches this level of independence and

⁵⁹ "The idea of the corporation as an entity is also apparent in courts' routine statutory construction of the term 'persons' to include corporate as well as natural persons." See David Millon, "Theories of the Corporation" (1990) *Duke LJ* 201 at 206.

⁶⁰ Jiahong Chen & Paul Burgess, "The boundaries of legal personhood: how spontaneous intelligence can problematise differences between humans, artificial intelligence, companies and animals" (2019) 27 *Artificial Intelligence and Law* at 73.

⁶¹ *Hotchkiss v The National City Bank* (1911) 200 F 287 at 293 (SDNY).

⁶² Hutan Ashrafian, "Artificial Intelligence and Robot Responsibilities: Innovating Beyond Rights" (2015) 21 *Science and Engineering Ethics* at 317-326.

consciousness should the law consider giving it a separate legal personality. At that stage, a machine of AI can think and act according to its perceived surroundings and its perceived responses, and its thoughts and actions go beyond human pre-set instructions and beyond the limits of human predictability and control.

Secondly, the intelligent advisor does not have ethical considerations. Some scholars have argued that current AI “cannot experience life as a good to itself given their lack of consciousness and would fall beyond the strict confinement of liability as a punishment aimed at deterrence”.⁶³ Civil punishment has a deterrent and moral discipline function for liable persons, which is an important function of civil liability in addition to economic compensation.⁶⁴ However, AI has not yet had a sense of shame and morality. AI with heart and spirituality like that of natural persons is conceivable but unrealised.⁶⁵

Finally, it is controversial whether AI can own property independently. Independent property ownership is the basis for civil liability, and AI usually does not own independent property to be used as civil compensation. Some scholars have proposed to establish a unified registration platform for the registration of AI and the creation of a common fund of reserves in order to enable AI to assume civil liability in the future.⁶⁶ While this proposal is reasonable, it is difficult to achieve under the existing legal framework.⁶⁷

Therefore, there is no jurisprudential basis to afford independent legal personality to robot advisors at this stage. Of course, when AI technology develops to satisfy the abovementioned three requirements in the future, it is necessary to grant intelligent advisors a separate legal personality.⁶⁸

2. *The applicability of long-arm rules on robot advisors*

If a robot advisor cannot become an independent legal person, it is necessary to identify a natural person or institution as the liable person for the wrongdoings of the intelligent advisor to avoid the failure of obligations.⁶⁹ Under the existing legal system, electronic agents are closely related to robot advisors.⁷⁰ The *Uniform Electronic Transactions Act* of the US provides that if a person uses an electronic agent to be the representor, the user shall be responsible for the actions of the electronic agent, even if the electronic agent’s conduct is not known or previewed by the users.⁷¹ The liability theory of vending machines under contract law can provide some clues for the liability of intelligent advisors. The explanation is that “[g]iven

⁶³ Argyro Karanasiou & Dimitris Pinotsis, “Towards a Legal Definition of Machine Intelligence: The Argument for Artificial Personhood in the Age of Deep Learning” (London: International Conference on Artificial Intelligence and Law, June 2017) at 7.

⁶⁴ See Scopino, *supra* note 4 at 509-512.

⁶⁵ See Jordan, *supra* note 23.

⁶⁶ See Scopino, *supra* note 4 at 515-516.

⁶⁷ *Ibid.*

⁶⁸ Lawrence B Solum, “Legal Personhood for Artificial Intelligences” (1992) 70 North Carolina Law Review 1231.

⁶⁹ See Schwarcz, *supra* note 43 at 458-459.

⁷⁰ See Mark MacCarthy, “What Payment Intermediaries are Doing about Online Liability and Why It Matters” (2010) 25(2) Berkeley Technology Law Journal 1037.

⁷¹ See *Uniform Computer Information Transactions Act*, s 112(b).

that] vending machines act in a pre-set manner, the act is directly regarded as the act of the operator of the machine who uses it for business. The legal liability of the machine's acts should be borne directly by the seller."⁷² Electronic agents can be regarded as the long arm of the operator. This theory can also be used to explain why financial institutions which use robot advisors should bear the liability from the acts of the robot advisors. Robot advisors can be regarded as the long arm of an operator that extends out to get information. As aptly pointed out by Chopra and White, "a person's leg can be extended further afield by means of transport, and a person's cognition can be reached deeper through a computer."⁷³ Although the operator does not have face-to-face contact with investors, it uses the long arms of robot advisors to reach out to investors to provide service and advice. Robot advisors are also based on their operator's pre-set programming instructions, working as the operator's agent in making analysis. Without an operation, an operator is "simply developing a biased set of algorithms that do not harm the results".⁷⁴

Placing a fiduciary duty on the operator also helps to resolve the biggest challenge confronting the liability system in the AI world, *ie* that it is hard to expect and trace to the cause of the results. Who should bear the residual risk if the acts of the AI are beyond the designer's expectation? The theory that the operator takes the fiduciary duty is not only consistent with the jurisprudence of tort law but also promotes the development of AI technology. It will push operators to establish a system in which the operators should ensure that the algorithm is consistent with the operators' intent and that the operator can identify and correct harmful results in a timely manner.⁷⁵ Furthermore, it will encourage operators to operate prudently and adopt an effective monitoring mechanism.

Compared with the duty of operators, it is more difficult to identify the duty of the developer of the robot advisor. Such developers include financial practitioners who provide a trading model and programmers who design the algorithm.⁷⁶ Should they only bear tort liability under tort law as the product developer? Under Chinese tort law, the responsibility of a developer of the intelligent investment advisor is limited to acts of the algorithm that can be attributed to the fault of the developer.⁷⁷ Generally speaking, the developer of the AI should only assume tort liability instead of a fiduciary duty. If an AI goes beyond the model envisaged by its designers, its operators should take responsibility for the residual risk instead of the designers.

⁷² Cui Guobin, "Regulating Framed Links through Copyright Law [Jiakuanglianjie de Zhuzuoquanfa Guizhi]" (2013) 5 Political Science & Law 86.

⁷³ See Chopra, *supra* note 5 at 189.

⁷⁴ See Caplan, *supra* note 25 at 21.

⁷⁵ See US Financial Industry Regulatory Authority, *Report on Digital Investment Advice*, online: US Financial Industry Regulatory Authority <<https://www.finra.org/sites/default/files/digital-investment-advice-report.pdf>> at 6 [*FINRA's Report*].

⁷⁶ Some giant financial institutions may have their own independent technology departments. However, except very few technology companies with financial licenses, the development of the algorithm for robot advisors is generally outsourced by financial institutions to independent third-party institutions. Here, we assume that the developers are different institutions from the operating institutions in our discussion.

⁷⁷ *PRC Tort Law*, *supra* note 45, art 6:

"One who is at fault for infringement upon a civil right or interest of another person shall be subject to the tort liability. One who is at fault as construed according to legal provisions and cannot prove otherwise shall be subject to the tort liability."

This approach would remove the concerns of designers instead of further hindering the innovation of AI.

However, although financial practitioners who develop robot advisors do not give direct trading opinions that are commonly regarded as financial activities, they do programme or help to programme the trading opinion in advance instead of just providing the technology. In other words, financial activities have essentially been pre-set. This is the core part of the business of robot advisors. This raises the question of whether financial practitioners should be included in the scope of investment advisors and owe a fiduciary duty. To answer this question, a distinction needs to be drawn between the different roles of financial practitioners and programmers who provide trading and decision-making models.

Financial practitioners should be recognised as fiduciaries and owe a fiduciary duty. The programmer is only the financial practitioner's assistant in programming the financial advising models into the algorithm, and they should not owe a fiduciary duty. The decisions made by robot advisors simulate the behaviour of financial practitioners who provide trading and decision-making models. The practice of robot advice is in fact pre-set by financial practitioners providing trading and decision-making models. This is not fundamentally different from face-to-face contact, as both involve a conflict of interest that needs to be balanced. In the process of designing the robot advisor algorithm, the financial practitioners participate in the setting of basic assumptions, important parameters, asset allocation logic, the profit-making / risk-hedging objectives of investors and market characteristics. These form the core content of robot advisory services. The practitioners' professional judgment and professional ethics directly affect the design of templates. Therefore, the law needs to include financial personnel providing the trading models as a fiduciary.⁷⁸

It is worth noting that the standards of fiduciary obligations of financial practitioners involved in the design of robot services differ from those of traditional fiduciary obligations. Firstly, traditional natural person investment advisors and investors usually have direct contact, through which advisors learn about the needs of investors and match assets accordingly. The standard of his duty of prudence is to carry out due diligence and use prudent investment strategy that would be adopted by prudent investment advisors under the same circumstance. In contrast, the financial person at the design stage of the robot advisor needs to predict the characteristics and the demands of various potential customers as well as the market environment. The human advisors provide intangible services that robots cannot provide.⁷⁹ In practice, the algorithms designed for robo-advisors in China usually apply a standardised basic model for all potential demands of clients. This setting adjusts the nature of the client-advisor interaction from one-to-one to one-to-many (an uncertain majority) and from real-time response to forecast. As a result, the requirements for prudential obligation have also been changed—the forecast parameters set by the financial practitioners

⁷⁸ Here, we only discuss the compliance issue. In practice, some of the smaller development institutions may not have a financial practitioner to participate in the development of algorithms. Instead, they may simply copy the algorithm of other institutions, which violates the basic requirements of personalisation of investment advisory services and also causes systemic risks due to the homogeneity of the algorithm.

⁷⁹ Jill E Fisch, Marion Labouré & John A Turner, *The Economics of Complex Decision Making: The Emergence of the Robo Adviser*, online: Oxford Online <<https://www.geog.ox.ac.uk/events/170911/Robo-vs-Human-Advisers-Aug-28.pdf>> at 4.

should reflect as fully as possible the characteristics and market conditions of potential investors. The comprehensiveness and reflection of parameters of variables in the future context become important criteria for judging the duty of diligence of financial practitioners involved in the development of robot advising services. Secondly, natural person investment advisors who provide one-to-one investment advice generally do not face the homogenisation problem. In contrast, financial practitioners at the design stage of robot advisors face many investors using the same process and therefore have the obligation to prevent homogenisation of investment advice and to avoid the associated systemic risk.

Unlike financial practitioners, programmers (technicians) simply use technology to convert pre-set 'advising' behaviours into algorithms. This is a relatively neutral act, and there is no need to regulate them with a fiduciary duty. The programmer is equivalent to the fiduciary's assistant and is not liable unless he intentionally or negligently causes damage to the investors. However, programmers still need to meet the basic qualification requirements for algorithm development, on top of having programming knowledge and skills. The complexity of financial algorithms requires them to execute many decisions which may fall beyond the reasonable contemplation of financial professionals. Although they are the fiduciary's assistants, they do have some discretion of execution. Therefore, they should satisfy the competency requirement and be qualified to programme the financial algorithm, which requires both knowledge of programming as well as finance. Because programmers have the discretion of execution, they also need to satisfy the basic algorithmic ethics requirements.

Robot advisor technology is constantly being upgraded. The rapid changes in financial markets require developers to adjust their models at any time. Therefore, there is still a need for having financial practitioners in an operating organisation to ensure the continued competence of the robot advisor.⁸⁰ These practitioners have a fiduciary duty. Their fiduciary duty is different from that of financial practitioners under the traditional model. The operating institutions need to check the output of the algorithm before delivering investment advice to the investors. Thus, it needs to hire financial practitioners to oversee and conduct ongoing checks on the advice provided by the robot advisor. According to the Australian Securities & Investments Commission's Regulatory Guide, institutions providing robot advisory service need to have at least one financial practitioner responsible for supervising and inspecting the results of their robot advisor.⁸¹ Because the financial practitioner has in fact assumed the role of a natural person advisor and the robot advisor algorithm is simply an automated tool with the purpose of improving efficiency, Australian regulators require the person who is responsible for supervising the robot advisor to have the

⁸⁰ It is important to note that in the United States, Germany and the United Kingdom, more than 80% of smart investment advisory operators have financial personnel to check regulatory smart investment advisors and it has become a common practice. See Deloitte, *The expansion of Robo-Advisory in Wealth Management*, online: Deloitte <<https://www2.deloitte.com/de/de/pages/financial-services/articles/the-expansion-of-robo-advisory-in-wealth-management.html>> at 2-4.

⁸¹ See Australian Securities & Investments Commission, *Regulatory Guide 255: Providing Digital Financial Product Advice to Retail Clients*, online: Australian Securities & Investment Commission <<https://download.asic.gov.au/media/3994496/rg255-published-30-august-2016.pdf>> at RG 255.53.

qualification of an investment advisor.⁸² Unlike the natural person investment advisor, the financial practitioner responsible for supervising the robot advisors generally does not have direct contact with investors. Their obligation is primarily to ensure that the services provided by the robot advisor consistently meet the standards of service that are required for a qualified natural person in the same position. This includes the requirement of ensuring the advice provided by the algorithm satisfies the obligations of loyalty, diligence and good faith. Of course, if the financial practitioner in charge of supervision finds that the results provided by the robot advisor do not satisfy the required standard, manual intervention is required, including direct contact with investors. In addition, the algorithm needs to be examined and maintained on a regular basis. Therefore, Australian regulators require financial institutions engaging in the robot advisory business to employ and retain technical personnel with knowledge of digital technology and algorithms for the day-to-day maintenance of algorithms.⁸³ These technicians are not fiduciaries, but the fiduciary's assistant. In addition, there is a need for oversight of these financial professionals and programming personnel who supervise the robot advisor. Therefore, financial institutions need to have managers and senior managers, who also owe a fiduciary duty.

B. *Reconstructing a New System of Obligations in the Context of Algorithms*

Regulators should not be entangled in how robot advisors are intelligent, but rather whether the output of robot advisors meets the same obligations as natural person investment advisors. As the Financial Industry Regulatory Authority ("FINRA") in the US has said in its regulatory report, regulators do not care about how financial institutions deal with AI, only what they provide to investors.⁸⁴ Thus, if the robot advisor is essentially a consultant business, then the advisor's fiduciary duty and compliance obligations still need to be satisfied. AI algorithm is still in the development stage and its development is unpredictable and difficult to interpret. On the other hand, algorithm is relatively more predictable compared with complex human nature.⁸⁵ Moreover, as mentioned earlier, fiduciary duty, through its broad scope and *ex post* nature, is intended to deal with the difficulty of interpretability and unpredictability of advisory behaviour. Of course, unlike the meaning of fiduciary duty for natural person investment advisors, the specific meaning of fiduciary duty under the robot advisor model needs to penetrate to the algorithmic level. How to combine the characteristics of the algorithm to set the content of obligations is a big challenge facing regulators in China. The *PBC Guidance* has not solved this problem. Policymakers need to balance the interests of promoting innovation in intelligent finance and the risk of liability failure. This paper raises a proposal for policymakers' reference as follows.

⁸² *Ibid.*

⁸³ *Ibid.*, RG 255.6.

⁸⁴ See *FINRA's Report*, *supra* note 75 at 1.

⁸⁵ Peizhong Gan & Chun Zhou, "Research on the Fiduciary Duty of Securities Investment Advisors" (2012) 10 *Application of Law* 33 at 33.

1. *The new duty of loyalty*

Although technology itself is neutral, the person who designs an algorithm is not necessarily neutral. Algorithms designed to serve the interests of financial institutions or other entities rather than the interests of investors would violate the duty of loyalty. Lawmakers may require operators of the robot advisor to satisfy their duty of loyalty by demonstrating that there is no bias or conflict of interest in the algorithms that may harm the interests of investors. When testing the duty of loyalty in the context of algorithms, the focus is on whether there is any conflict of interest in the algorithm. Based on the business models in China, regulators need to check whether there are related parties involved in developing or managing the algorithms, which may cause potential conflicts of interest or whether the algorithm will direct investors to third parties in order to earn commission fees. If so, the conflict of interest must be disclosed.

The report of FINRA states that when examining whether there is a conflict of interest, regulators may focus on whether the algorithm contains parameters that would give rise to a conflict of interest.⁸⁶ In a portfolio investment, the focus may be whether the output is preferential or biased towards certain financial products. If so, the operator has the obligation to explain why the algorithm is justified to have such a design and to provide a detailed comparison between the products selected and not selected.⁸⁷ At present, some robot advisors in China are essentially marketing platforms for a few particular funds and only function to direct the clients to the related parties, *ie* the investment funds. This business model causes big concerns of conflicts of interest. Robot advisors should truthfully disclose conflicts to investors and obtain investors' consent to tolerate such conflicts. Although the duty of loyalty based on conflicts of interest may be waived by the consent of the customer, the duty of good faith cannot be waived.⁸⁸ If the robot advisor's algorithm is not designed in good faith, the operator of the robot advisor may still be found by courts as breaching his duty of loyalty.

2. *The new duty of care*

Due to the uneven level of service provided by robot advisors in the market, it is necessary to ensure that the services provided by robot advisors are equivalent to those provided by prudent natural person investment advisors. Duty of care will be an effective mean to this end.⁸⁹ The fiduciary's duty of care requires the fiduciary to satisfy the standards of a prudent person in the same circumstances with similar status.⁹⁰ The core of the robot advisor business is to transform financial models and assumption inputs (including portraits of investors, portfolio traits and other

⁸⁶ See US Securities and Exchange Commission, *Investment Management Robo Advisor Guidance* [SEC Guidance].

⁸⁷ See *FINRA's Report*, *supra* note 75.

⁸⁸ *Restatement*, *supra* note 41, s 78.

⁸⁹ *Ibid*, s 379.

⁹⁰ See *FINRA's Report*, *supra* note 75 at 3.

factors) into an algorithm which outputs investment advice.⁹¹ The fiduciaries⁹² in the business of robot advisors have a duty of care to ensure that the algorithm is able to perform the expected tasks, and any deviation in the algorithm will not go beyond a reasonable range to cause damage on the interests of investors. The threshold for violating the duty of care should not be too low to unduly burden operators or financial practitioners at the design stage. The simple negligence standard should be applied. AI development is currently still in its infancy. Algorithms making use of neural networks can do things that no one can predict. However, current robo-advisor systems in China mostly only involve simple expert systems that are fully predictable and deterministic. Lawmakers should also take into consideration the costs incurred by the obligor to prevent accidents.⁹³ The simple negligence standard only requires an operator operating a robot advisor to comply with the prudent standards of average diligence in the same industry.

In testing whether the operator has fulfilled his duty of care, courts may adopt the two-step test proposed by FINRA.⁹⁴ The first step is a preliminary review on whether the relevant assumptions are appropriate for the task and to ensure that the input model, hypothesis and output results are consistent with expectations. The second step is an ongoing review that requires operators to demonstrate that they have fulfilled their ongoing duty of care and that they have effective mechanisms within the institution to assess whether the input model is adapted to market changes, whether the output is consistent with expectations and whether deviations can be corrected in a timely manner. In determining the fiduciary's liability, the burden of proof is on the fiduciary to prove the absence of fault.

To set more specific rules, policymakers may consider the accountability model proposed by the Centre for Data Innovation⁹⁵—when damage occurs, the first step is to check whether the fiduciary has effective control over the robot advisor and whether the mechanism the operator has control over satisfied general industry standards. The second step is to check whether the fiduciary can effectively identify and correct harmful outcomes. The fiduciary shall not be liable if he or she can demonstrate that he has taken effective control in accordance with general industry standards and has identified and corrected harmful results with due diligence. However, the market force of autonomy is too weak to make the appropriate standard; therefore, the China Securities Regulatory Commission may need to issue the standard instead as the regulator in the market.

If the fiduciary is unable to demonstrate that he has effective control or it is proven that he is at fault in exercising his control or he has failed to identify and correct harmful results with due diligence, then he needs to take full responsibility. The fiduciary is only partially responsible if he can demonstrate that he has adopted effective control in accordance with the general industry standards but has not identified and corrected harmful results with due diligence.

⁹¹ *Ibid.*

⁹² We have discussed who are fiduciaries in Part III.

⁹³ See *US v Carroll Towing* (1947) 159 F.2d 169 (2d Cir).

⁹⁴ See *FINRA's Report*, *supra* note 75 at 3.

⁹⁵ See Joshua New & Daniel Castro, *How Policymakers Can Foster Algorithmic Accountability*, online: Centre for Data Innovation <<http://www2.datainnovation.org/2018-algorithmic-accountability.pdf>> at 26.

3. *New meaning of compliance obligations*

Compliance obligations in the context of algorithms focus on ensuring the competence of robot advisors and fulfilling obligations owed to investors, as well as market entry and registration requirements. The difficulty in the context of algorithms is that the disclosure of algorithms must be sufficient to help regulators determine whether the duty of compliance has been fulfilled.

The competence of robot advisors should be a key regulatory issue. Robot advisors rely on algorithms and networks to provide their services and lack face-to-face communication with clients. Hence, they may be flawed in ensuring that investors meet the requirement to make decisions based on full knowledge of available information.⁹⁶ The competence obligation requires disclosure of information to regulators and the public in advance. Information disclosure can be achieved under the robot advisor model, but in different ways. Since the algorithm is pre-set, it is logically explainable and verifiable to some degree. The algorithm under the robot advisor model involves two factors, namely financial products factors, investor factors and a matching of these two factors. Therefore, there are two important factors to be considered when evaluating the competence of algorithms by law—the range of data that the algorithm can obtain and the quality of the data. FINRA requires programme developers to test algorithms before delivering them to operators to ensure that the output of their algorithms is consistent with pre-set goals.⁹⁷ At the same time, the developer also needs to disclose the basis and effect of the algorithm, including the model it uses, the appropriateness of the data on which the model is based, the basis for the interpretation of the model and the results the algorithm can achieve.⁹⁸

This paper proposes that designers should only disclose the logic and expected results of the algorithm, but not the interpretation and disclosure of source code. Because of the nature of algorithms, designers can understand their logic but may not be able to explain the specific factors that lead to their results. The disclosure and interpretation of all factors are actually difficult to do considering the current stage of AI. The disclosure of source code will increase the risk of source code plagiarism, which may hinder algorithm research and development enterprises. Code plagiarism not only leads to the infringement of the intellectual property rights of the developer but also causes systemic risk to financial markets in the form of homogenisation of robot advisory products. Algorithm developers also have an obligation to examine whether there are reports that identify the results of the algorithm output to be different from those expected and prevent the algorithm from producing abnormal results.⁹⁹ With the assistance of experts, the regulators need to assess whether the algorithms of robot advisors meet the requirements of competence. To maintain the competence of algorithms, designers should disclose code changes that have a significant impact on results. Regulators can employ experts familiar with financial algorithms to monitor the algorithms and modules used by robot advisors. Any change of the algorithmic

⁹⁶ See *SEC Guidance*, *supra* note 86.

⁹⁷ See *FINRA's Report*, *supra* note 75.

⁹⁸ *Ibid.*

⁹⁹ *Ibid.*

code that has a significant impact on robot advisors' portfolios needs to be continuously disclosed to regulators and investors.¹⁰⁰ In addition, the law may also require operators to continuously evaluate whether the model used by robot advisors is still applicable to changes in markets and other conditions. If the models cannot keep up with changes, operators need to adjust them in a timely manner and ensure that they can reach the desired effect.¹⁰¹

The ethics and capability of the person designing the algorithm directly determines the quality of the robot advisor. Unreasonable design of the algorithm may lead to herd effect and systemic risk. To ensure the competence of technicians, lawmakers may require technicians involved in the development of robot advisors to complete basic training in systemic risk and professional ethics and to undertake the relevant professional ethics examination. Technicians who pass the exam can apply to the financial regulator for registration. The function of licensing and registration is to identify market participants and regulate their behaviour.¹⁰²

The *PBC Guidance* pronounced the general principle that "financial institutions using robot advisors to carry out asset management business should strictly comply with the requirements of the investor suitability obligation and need to fully disclose the inherent defects of robot advisor algorithm and risks."¹⁰³ This paper proposes the following standard for the duty of investor suitability at the algorithm level. The investor suitability obligation requires the advisor to have an in-depth understanding of investors and products. Nevertheless, robot advisors lack face-to-face interaction with investors, and the questionnaire is an essential tool for understanding the characteristics of investors. Therefore, it is necessary for the law to set basic requirements for the questionnaire design, to ensure that the robot advisor can collect the necessary information and has the ability to respond to conflicts and continuously update information. The *SEC Guidance* requires that the questionnaire be designed to meet the criteria of providing sufficient information to reflect the investor's risk tolerance and demands so that the robot advisor can reach conclusions that are appropriate for the investor.¹⁰⁴ The developer of the algorithm must ensure that the algorithm can make an appropriate judgment, deal with the investor's contradictory answers in the questionnaire, and clearly state the matching logic, assumptions and possible limitations that allow investors to make informed choices of services.¹⁰⁵ To ensure that the data collected is sufficient for fulfilling the suitability obligation, the questionnaire should obtain data reflecting the characteristics of investors and markets. The questionnaire should also be able to collect sufficient and detailed information to distinguish different investors and products. The design of the questionnaire should avoid classifying the different investment needs of investors into the same category or different market characteristics of financial products into the same category, thereby preventing homogenisation through matching results. Failure to do so may not only violate the suitability obligation, but may also pose systemic risks due to the homogenisation of results.

¹⁰⁰ See *SEC Guidance*, *supra* note 86.

¹⁰¹ See *FINRA's Report*, *supra* note 75.

¹⁰² *Ibid.*

¹⁰³ *PBC Guidance*, *supra* note 56, art 23.

¹⁰⁴ See *SEC Guidance*, *supra* note 86.

¹⁰⁵ See *FINRA's Report*, *supra* note 75.

If the information collected through questionnaires does not achieve the same depth and sufficiency as what a prudent natural person investment advisor can collect, then the person who supervises the robot advisor is obliged to intervene manually, through direct contact with investors to collect additional information. In addition, operators must have a continuous tracking system to ensure that the algorithm can track changes in investor information and that investment advice continuously matches the characteristics and demands of investors.

V. CONCLUSION

Strengthening the penetration of responsibility in robot advisor models is consistent with the change in financial regulation philosophy in China. Firstly, the issuance of the *PBC Guidance* urges the industry to reconstruct a healthy fiduciary relationship. Therefore, fiduciary duties and the duty of compliance must be strengthened by law to better govern the financial consulting industry, including the robot advisor industry which is undergoing financial innovation. Secondly, effective regulation is a prerequisite for inclusive finance. The service fee of robots advisors is relatively low, which is undoubtedly good for the promotion of financial inclusion by providing more available services to a larger population. Nevertheless, promoting financial inclusion must be premised on effective regulation. Otherwise, fraud will devastate public confidence in the financial market. Compared with the unpredictability and uncontrollability of complex human nature, algorithms can be more understandable and predictable. It is undoubtedly easier to achieve effective regulation if the logic of the algorithm is disclosed in advance to the regulators. Therefore, a renewed obligation system and the identification of obligors in the context of algorithms is necessary.

The discussion in this paper is based on the current developmental stage where AI and intelligent financial agents lack independent legal personality. Therefore, it is necessary to renew the obligation system to prevent liability failure which will destroy investors' confidence in the market and lead to systemic risk. Needless to say, if AI develops to have independent sense and independent legal status in the future, the obligations of AI should be discussed. Technology keeps changing and progressing and the law should also keep up with these innovative changes. In the era of intelligent finance, regulators also need to enhance the ability of intelligent regulation.¹⁰⁶ Pragmatic solutions are needed, not platitudes.

¹⁰⁶ See Cary Coglianese & David Lehr, "Regulating by Robot: Administrative Decision Making in the Machine-Learning Era" (2017) 105 Geo LJ 1147.