FINTECH

Adoption and Innovation in the Hong Kong Banking Industry

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CONTENTS

FOREWORD

In recent years, waves of financial technology (or Fintech) innovations, enabled by rapid developments in telecommunications and information technology, have led to an increasing degree of digitalisation and the emergence of various new technological applications and solutions in the global financial sector. These developments promise to have profound implications for banks' business operations and the structure of the banking industry.

Depending on banks' ability to adapt and adjust their business models, Fintech could be viewed as a competitive threat, or as an opportunity to leverage technologies to promote financial innovations, enhance customer experiences, facilitate financial inclusion and achieve greater cost efficiencies. Given their relative importance in Hong Kong's financial sector and their integral role in intermediating funds for the economy, the effect of Fintech on banks' business operations is expected to be of keen interest to the financial industry, regulators and academia in Hong Kong.

This report explores the current landscape of Fintech development in the Hong Kong banking industry and how banks view the future of Fintech development in the next 10 years. It highlights the results of an industry-wide survey commissioned by the Hong Kong Institute for Monetary and Financial Research (HKIMR) to assess the status of banks' adoption of Fintech in Hong Kong and to gather insights on the important trends and evolution of Fintech development in the Hong Kong banking industry. The surveyed entities include banks accounting for around three-quarters of total assets and more than 80% of total customer deposits in the Hong Kong banking industry, as well as recently licensed virtual banks.

This is the first in a series of research reports published under the Applied Research Programme of the HKIMR following the establishment of the Hong Kong Academy of Finance (AoF), guided by the Council of Advisers for Applied Research that comprises representatives from the financial regulators, industry and academia.

These reports will cover research topics that are highly relevant to the financial industry and regulators in Hong Kong and deal with broad research themes that explore new developments in financial markets with the aim of providing the financial industry in Hong Kong with ideas regarding its strategic development in the long run.

We hope that this report offers insights and useful points of reference on Fintech adoption in the Hong Kong banking industry and its implications for the industry, markets and regulators.

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Senior Executive Director
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ACKNOWLEDGEMENTS

The research report is based on the study by Kelvin Ho of the Hong Kong Monetary Authority (HKMA) Market Research Division and Jim Wong, entitled "The Impact of Fintech innovations on the Hong Kong Banking Industry", published as HKIMR working paper No. 8/2020. The HKIMR also thanks the Council of Advisers for Applied Research and colleagues at the HKMA Banking Supervision Department for their continued support and guidance and for their useful comments and suggestions on earlier drafts of the report.

EXECUTIVE SUMMARY

Fintech innovations enabled by rapid developments in telecommunications and information technology have led to an increasing degree of digitalisation and the emergence of various new technological applications and solutions in the financial sectors globally. These developments in the financial sector have been driven by several factors, including cost optimisation, operational efficiency improvement considerations and responses to greater competition from non-bank players that necessitate the adoption of new technological innovations.

With growing interest in Fintech and an increasing trend of global investment in related areas, it is envisaged that banks' business operations may be significantly affected. Depending on banks' ability to adapt and adjust their business models, Fintech could present as a competitive threat, or as an opportunity to achieve greater cost efficiencies, improve customer experiences and facilitate financial inclusion. Given their importance in Hong Kong's financial sector and their integral role in intermediating funds in the economy, the impact of Fintech on banks' business operations, and how banks view the future of Fintech development are expected to be of interest to the financial industry, regulators and academia.

This report presents and discusses the results of a survey conducted with banks in Hong Kong, including the recently licensed virtual banks, to obtain industry-wide qualitative information and to gather insights on the important trends and evolution of Fintech development in the Hong Kong banking industry, both currently and in the future.

The survey results indicate that Fintech is viewed as a complement and enabling technology by the Hong Kong banking industry.

Fintech has been widely applied across all types of financial services by incumbent banks, with about half or more of them adopting the innovations in payment and fund transfer, personal finance, savings and deposit account services, investment and wealth management services, back-office operations and IT security systems. As for virtual banks, most of them indicate that they would apply Fintech innovations in almost all the services that they plan to operate.

Innovations relating to "mobile banking", "open banking (APIs)", "machine learning and predictive analytics", "customer identification and authentication" and "cloud computing" have been commonly applied by over 40% to up to two thirds of the incumbent banks. While related applications for "robo-advisory", "regtech solution", "distributed ledger" and "smart contracts" have been less widely used, most respondents have plans to apply them in the future. As for virtual banks, they have shown keen interest in almost all identified solutions.

The incumbent banks have taken a pragmatic approach, adopting a wide range of Fintech innovations across financial services whilst eschewing applications of marketplace platforms that could facilitate a shift to disintermediation. This is in contrast to virtual banks, about 40% to half of which indicate likely adoption of these applications.

Overall, the incumbents view Fintech more as an opportunity than a threat to their business operations, now and in the next five years. Notably, a higher percentage of the incumbent banks see Fintech as presenting opportunities across all financial services in the next five years (ranging from 50% to 77%) compared to now (ranging from 35% to 56%).

Although in general it may appear premature to evaluate the effectiveness of Fintech adoption, there are already some early signs of payoff, with more than a third of the incumbent banks stating that their prime objectives of adopting Fintech have been met. Initial results show that changes in banks' cost-to-income ratio and return on assets (ROA) are statistically correlated with their Fintech adoption status. Banks with more widespread adoption of Fintech are associated with greater cumulative reduction in cost-to-income ratio and larger cumulative rise in ROA, other things being equal. These preliminary findings suggest that the adoption of Fintech has so far produced some positive effects on banks' performance.

Most banks take either a "proactive adopters" approach to achieve first mover's advantage or a "reactive adopters" strategy where transformational changes are implemented at a steady pace, rather than engaging in Fintech only when the technologies are more mature and widely adopted or not dealing with Fintech at all. To that end, most retail and virtual banks have or plan to set up dedicated divisions or teams, mostly located in Hong Kong, though fewer foreign banks have so far established their teams domestically. To accelerate the adoption of Fintech innovations, various forms of engagement in relation to Fintech have been undertaken, including "develop in-house", "purchase Fintech products and services from external parties", "forming partnerships with Fintech firms" and others.

The pace and degree of Fintech adoption will, however, hinge on whether certain challenges can be overcome, amongst which difficulties in ensuring information security, data privacy and protection, difficulties in retaining and attracting talents, domestic as well as international regulation related to Fintech evolution, and banks' legacy IT systems are considered as key challenges by most banks. These challenges are not unique to Hong Kong and can be observed in the banking industries of other economies. For some of these hurdles, policymakers could have a role to play.

How Hong Kong's banking industry structure may evolve over the next decade in the face of Fintech developments has been widely debated. **Incumbent banks are confident that, through adapting to the new environment, they will continue to play a key role and would not be displaced by new competitors.** Most incumbent banks (73% of the respondents) consider the "better bank scenario", where banks digitise and modernise themselves to retain the customer relationship and core banking services, as highly possible. **Nonetheless, they appear not to rule out other less but still dramatic scenarios as possibilities.**

While most virtual banks (63% of the respondents) consider the "better bank scenario" as highly possible, half of them also see both the "distributed bank scenario", where banks and Fintech firms operate as joint ventures or partners, and the "new bank scenario", where traditional banks are replaced by new technology-driven banks, as highly possible. This suggests that virtual banks in general expect a bigger impact of Fintech innovations on traditional banking services and a more dramatic change in the structure of Hong Kong's banking industry.

If banks' views are any guide, precautionary preparations for more dramatic changes in Hong Kong's banking industry structure, such as strengthened monitoring on the Fintech development as well as increased cooperation with different authorities responsible for oversight of regulatory functions related to Fintech, may be warranted.

1 TECHNOLOGY REVOLUTION

BANKS VIEW IT AS AN OPPORTUNITY RATHER THAN A THREAT

Fintech is viewed as a complement and enabling technology by the Hong Kong banking industry. Most incumbent banks have taken a pragmatic approach, adopting a wide range of Fintech innovations across financial services whilst eschewing applications of marketplace platforms that could facilitate a shift to disintermediation. Overall, the incumbents view Fintech more as an opportunity than a threat to their business operations, currently and in the future.

TECHNOLOGY REVOLUTION

BANKS VIEW IT AS AN OPPORTUNITY RATHER THAN A THREAT

The Hong Kong banking industry has been embracing Fintech actively. Incumbent banks consider Fintech as a complement and enabling technology which facilitates efficiency improvements and financial inclusion, out-numbering significantly those seeing it as a threat and a replacement for their existing businesses.

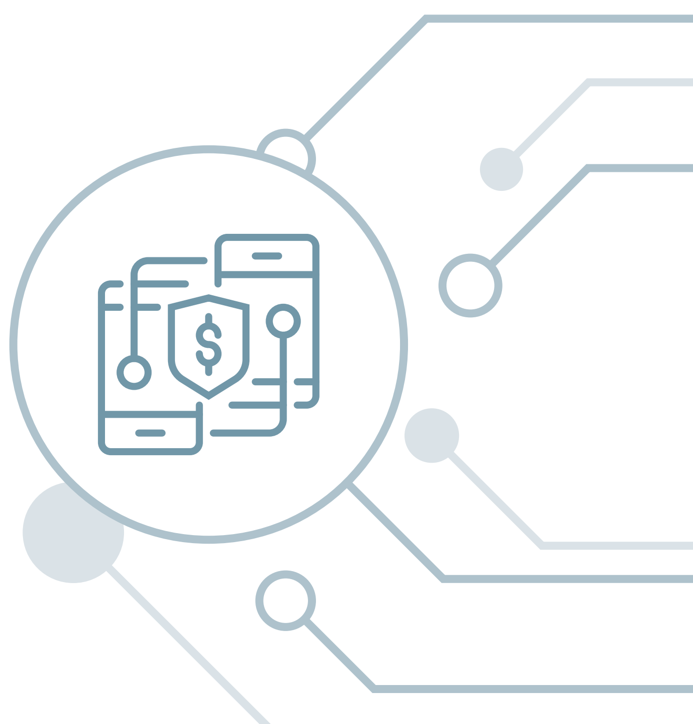
The impact of Fintech is being increasingly felt, with most bank surveyed that consider no impact currently, realising that they could not be unaffected in the future. Most incumbent banks have taken a pragmatic approach and have made tangible efforts to adopt Fintech in their business operations.

A wide range of Fintech innovations have been adopted generally in banks' operations, albeit by various degrees. In particular, innovations relating to "mobile banking", "open banking Application Programming Interfaces (APIs)", "customer identification and authentication", "machine learning and predictive analytics" and "cloud computing" have been commonly applied, with over 40% to up to two thirds of the incumbent banks revealing that these innovations have been partially adopted in their institutions. In general, the applications of Fintech amongst foreign banks have been less widespread than retail banks, with the exceptions being the use of "machine learning and predictive analytics" and "robo-advisory".

Understandably, most incumbent banks are not keen on applications of marketplace platforms, including "crowd-funding", "lending marketplaces" and "savings and deposit marketplaces", which could facilitate a shift to disintermediation. This is in contrast to virtual banks, about 40% to half of which indicate likely adoption of these applications.

Across all financial services, an even greater proportion of the incumbent banks view Fintech as opportunities in the next five years compared to now, with the proportion corresponding to opportunities continuing to exceed that for threats.

Overall, the incumbent banks view Fintech more as an opportunity than a threat to their business operations, both currently and in the next five years.



TECHNOLOGY REVOLUTION

BANKS VIEW IT AS AN OPPORTUNITY RATHER THAN A THREAT

OPPORTUNITY OR THREAT?

Entities driven by Fintech could emerge as strong competitive alternatives to traditional financial intermediaries, markets, and infrastructures, and develop to be threats to incumbent banks. On the other hand, Fintech presents opportunities to lower costs, enhance customer experiences and facilitate the expansion of client base through the development of new services to meet the demand from under-served customers.

For most areas of financial services, more surveyed incumbent banks consider Fintech as an opportunity to their institutions (ranging from 35% to 56% of respondents by respective services) than those seeing it as a threat (9% to 36%) currently.

Savings & deposit account services
36%
27%

Payment & fund transfer
47%
26%

FX transaction & remittance
42%
30%

Personal finance
36%
36%

Mortgage loans
35%
22%

Corporate lending
39%
9%

Trade financing
56%
9%

Investment & wealth management services
47%
30%

Brokerage services
40%
32%

Cash & liquidity management
40%
13%

Risk management services
40%
25%

Custodian services
46%
12%

Percentage of incumbent bank respondents – Views on Fintech's current impact (areas of financial services)

■ Opportunity ■ Threat

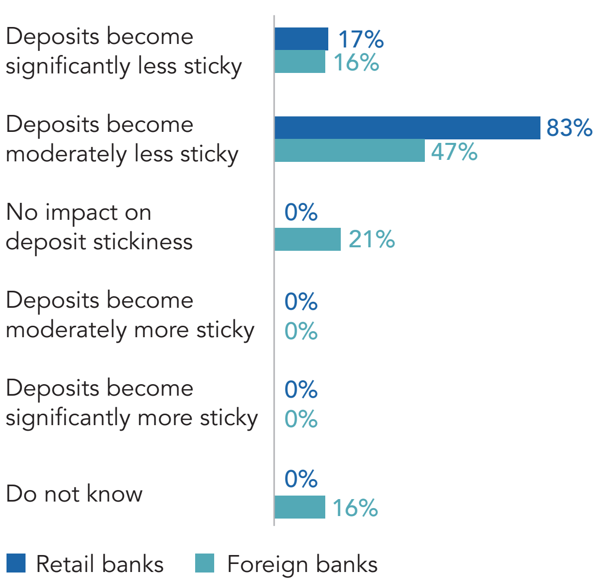
TECHNOLOGY REVOLUTION

BANKS VIEW IT AS AN OPPORTUNITY RATHER THAN A THREAT

ANTICIPATED EFFECT OF FINTECH ON INCUMBENT BANKS' DEPOSITS

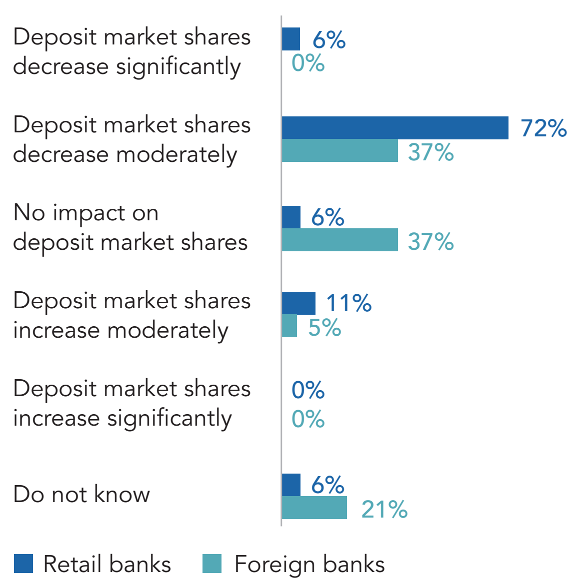
With the emergence of new competition from virtual banks and Fintech firms providing greater convenience and attractive pricing via innovative Fintech solutions, customers may shift their deposits amongst banks more frequently, resulting in lower deposit stickiness as well as lower deposit market shares for the incumbent banks.

Incumbent banks were asked for their views on the potential impacts of Fintech on deposit stickiness and their deposit market shares, in the next three years. Nearly two-thirds of the incumbent banks (65%) expect deposits to become moderately less sticky and over half of them (54%) expect their deposit market shares to decrease moderately.



The majority of the incumbent banks are of the view that in the next three years, the effect of Fintech on deposit stickiness and deposit market shares will be moderate.

Most retail banks (83%) and nearly half of the foreign banks (47%) expect deposits to become moderately less sticky, while few banks anticipate the deposit stickiness to decrease significantly. More than 70% of retail banks are of the view that their deposit market shares will decrease moderately, while foreign banks seem less pessimistic, with only 37% of them expecting a moderate decline.



BANKS VIEW IT AS AN OPPORTUNITY RATHER THAN A THREAT

FEELING THE IMPACT OF FINTECH

Reflecting the growing influence of Fintech on the banking industry, the proportion of incumbent banks expecting Fintech to have no impact on their business operations in the next five years is significantly lower (0% to 26%) than that currently (23% to 52%). Most of the incumbent banks considering no impact on their business operations currently, recognise that they could not be unaffected in the future.

The impact of Fintech is being increasingly felt, with most banks surveyed considering no impact currently, recognising that they could not be unaffected.

	No Impact	
	Current	Next Five Years
Savings & deposit account services	36%	6%
Payment & fund transfer	26%	6%
FX transaction & remittance	27%	3%
Personal finance	27%	0%
Mortgage loans	43%	8%
Corporate lending	52%	16%
Trade financing	34%	15%
Investment & wealth management services	23%	3%
Brokerage services	28%	8%
Cash & liquidity management	47%	16%
Risk management services	35%	0%
Custodian services	42%	26%

23%–52% expecting **no impact from Fintech on respective financial services currently**

0%–26% expecting **no impact from Fintech on respective financial services in the next five years**

TECHNOLOGY REVOLUTION

BANKS VIEW IT AS AN OPPORTUNITY RATHER THAN A THREAT

WIDESPREAD FINTECH ADOPTION ACROSS ALL FINANCIAL SERVICES

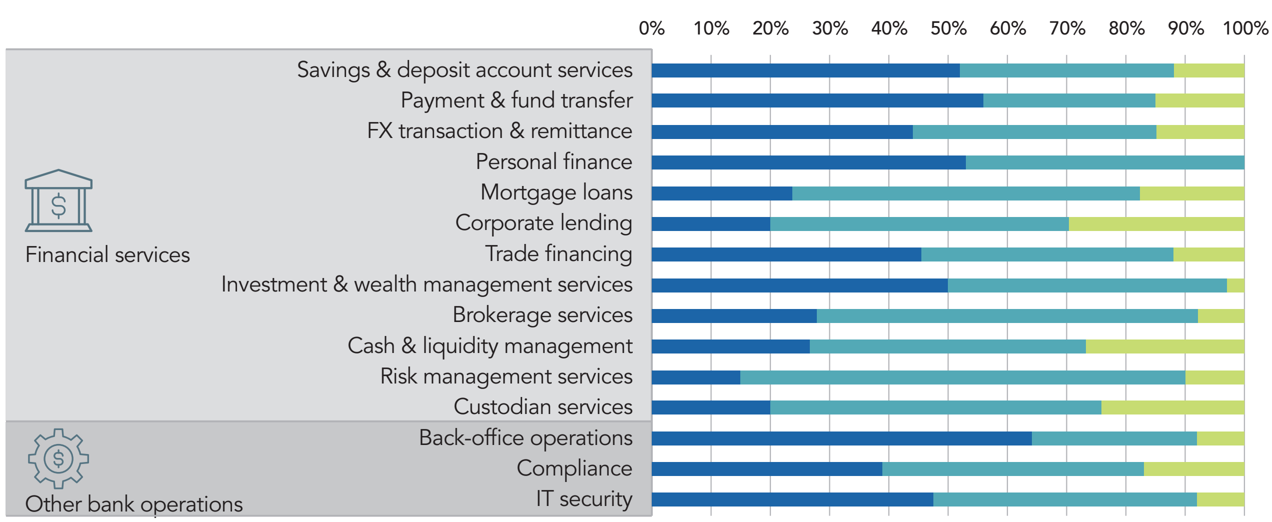
Fintech firms are driving changes in financial markets by developing innovative technologies that reduce costs and provide customers with improved experiences. Banks respond by either embracing such development or are forced to adapt to this fast-changing market environment by applying these new financial technologies in order to stay competitive.

Incumbent banks in Hong Kong are embracing Fintech and progressively applying Fintech innovations across all types of financial services, with most respondents (ranging from 70% to 100% of them) either having applied or planning to apply Fintech innovations in the various lines of businesses undertaken by their institutions.

Half or more of the incumbent banks reveal that they have either adopted a broad range or a limited number of Fintech innovations in savings and deposit account services, payment and fund transfer, personal finance, and investment and wealth management services.

For most other areas where less than half of the incumbent banks have adopted any Fintech innovations, most respondents indicate that they plan to do so.

Fintech solutions have also been commonly applied in incumbent banks' back-office operations, compliance and IT security systems, suggesting that banks in Hong Kong are keen to apply new financial technologies to improve efficiency and reduce labour intensive tasks via various digitalisations and automation transformation in their infrastructures.



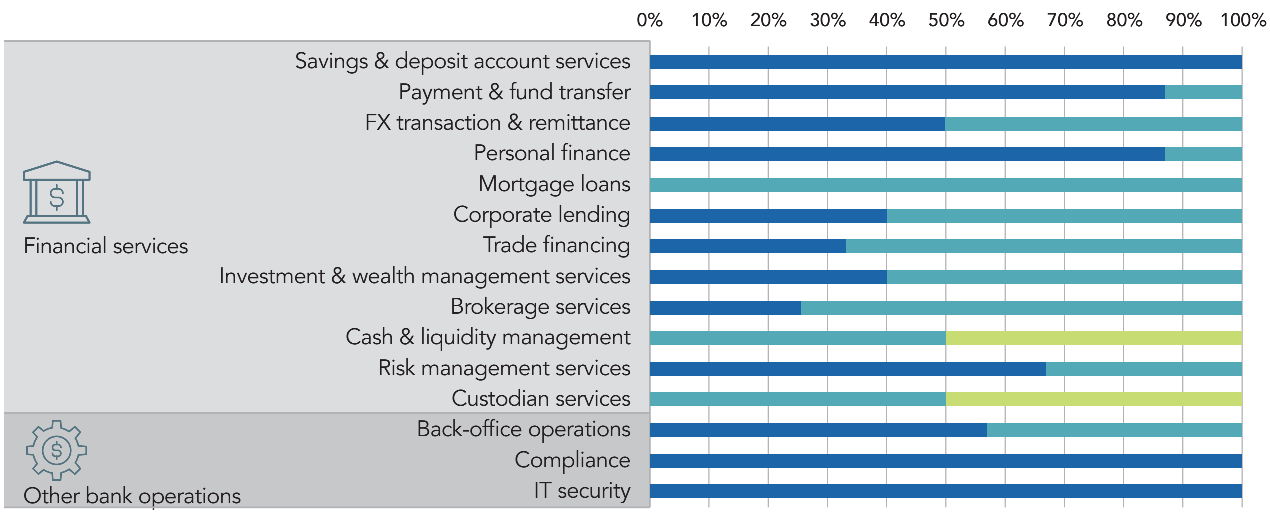
Percentage of incumbent bank respondents – Fintech application status (areas of financial services and other bank operations)

■ Already applied a broad range or a limited number of Fintech ■ Not yet applied but plan to do so ■ Have no plan to apply

TECHNOLOGY REVOLUTION

BANKS VIEW IT AS AN OPPORTUNITY RATHER THAN A THREAT

As for virtual banks, Fintech innovations are to be applied by most of them in almost all the services that they plan to operate, with cash management and custodian services being the exceptions.



Percentage of virtual bank respondents – Fintech application status (areas of financial services and other bank operations)

■ Already applied a broad range or a limited number of Fintech ■ Not yet applied but plan to do so ■ Have no plan to apply

TECHNOLOGY REVOLUTION

BANKS VIEW IT AS AN OPPORTUNITY RATHER THAN A THREAT

A list of Fintech innovations categorised under six broad areas of big data analytics and artificial intelligence, mobile technologies, distributed computing, marketplace platforms, cloud computing and open APIs, and cryptography, is identified for the Hong Kong banking industry with the aim of surveying the extent of adoption in the respective areas. This categorisation of innovations is purposefully generalised and some innovations may span multiple areas.

TECHNOLOGY REVOLUTION

BANKS VIEW IT AS AN OPPORTUNITY RATHER THAN A THREAT

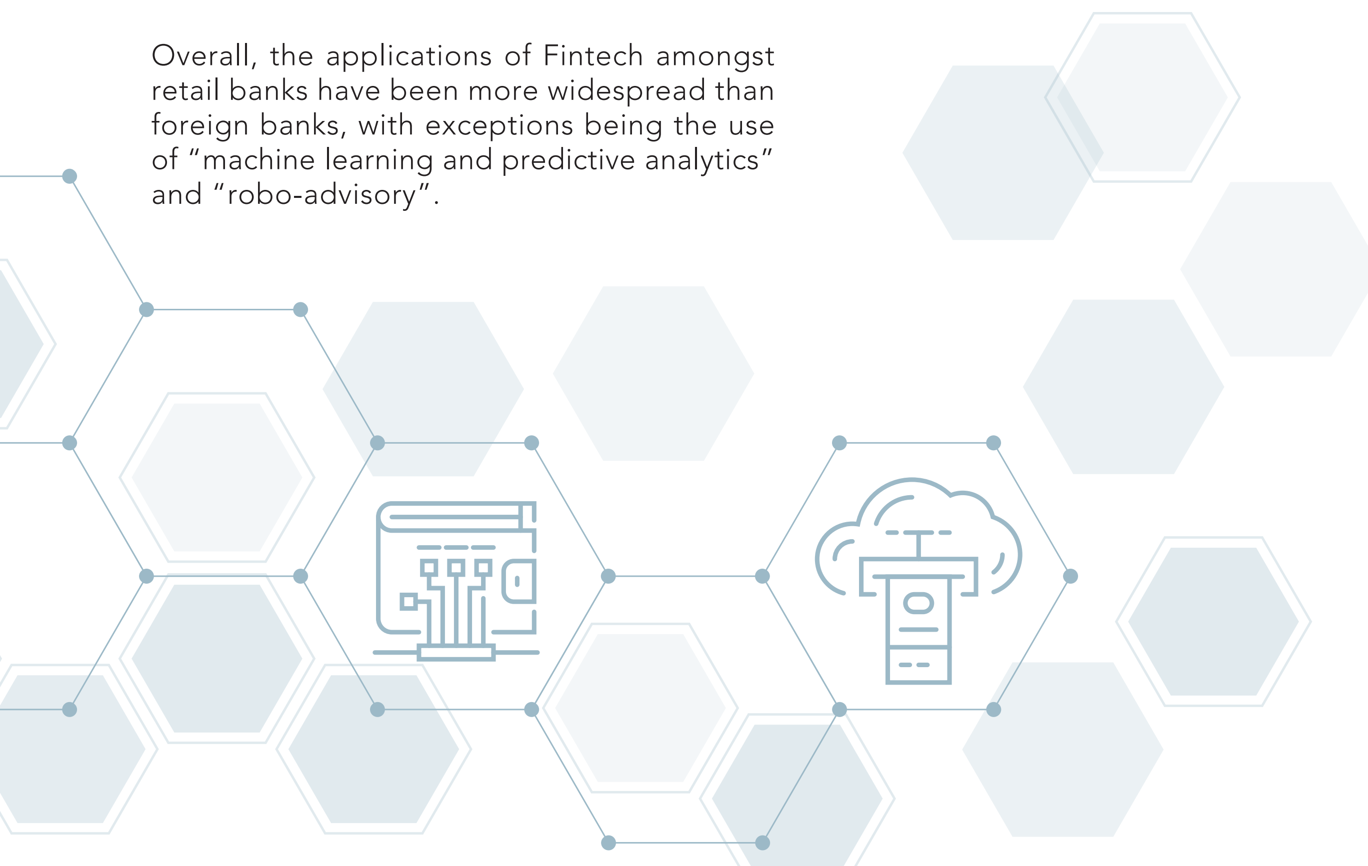
PRAGMATIC APPROACH TOWARDS FINTECH INNOVATION ADOPTION

A wide range of Fintech innovations have been adopted generally in banks' operations, albeit by various degrees. Innovations relating to "mobile banking", "open banking (APIs)", "customer identification and authentication", "machine learning and predictive analytics" and "cloud computing" have been rather commonly adopted, with over 40% to up to two thirds of the incumbent banks revealing that these have been partially adopted in their institutions.

While related applications for "robo-advisory", "regtech solution", "distributed ledger (e.g. blockchain)" and "smart contracts" have not yet been widely used, most banks indicate that they either are using or plan to apply them in the future.

Overall, the applications of Fintech amongst retail banks have been more widespread than foreign banks, with exceptions being the use of "machine learning and predictive analytics" and "robo-advisory".

Most incumbents have taken a pragmatic approach, adopting a wide range of Fintech innovations across financial services whilst eschewing marketplace platforms that could facilitate a shift to disintermediation.

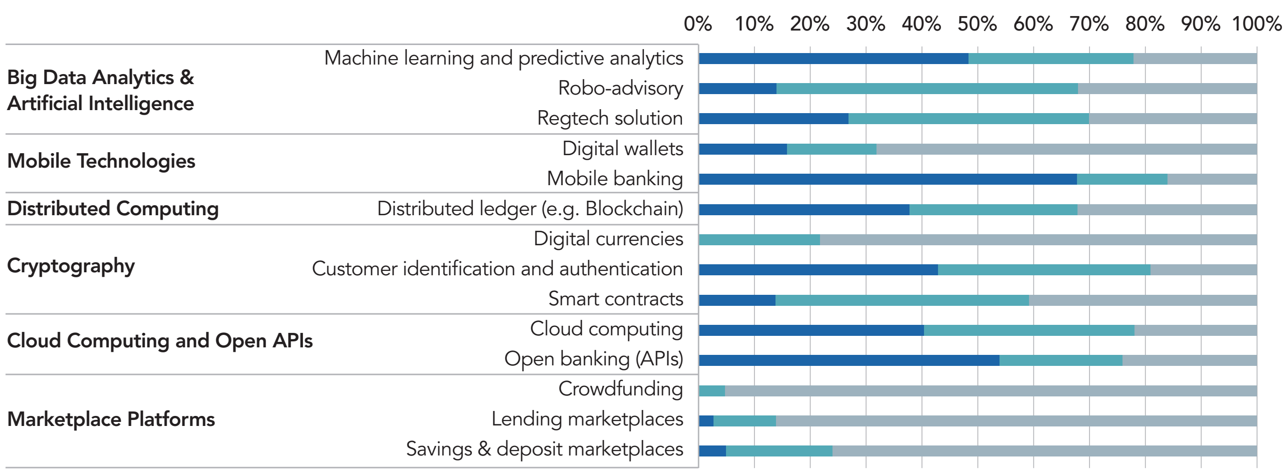


TECHNOLOGY REVOLUTION

BANKS VIEW IT AS AN OPPORTUNITY RATHER THAN A THREAT

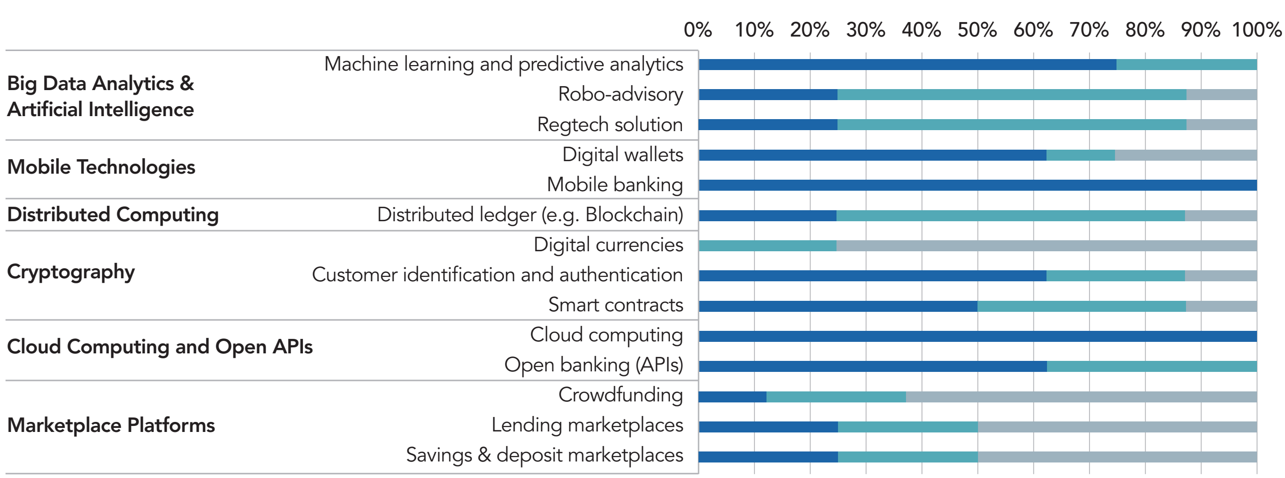
INCUMBENT BANKS ARE NOT KEEN ON MARKETPLACE PLATFORMS

Understandably, most incumbent banks are not keen on marketplace platforms innovations including "crowd-funding", "lending marketplaces" and "savings & deposit marketplaces", which could facilitate a shift to disintermediation.



Percentage of incumbent bank respondents – Status of Fintech adoption (areas of innovations)
- Already applied partially, and will apply more either to a limited or full extent
- Not yet applied but have plan to apply either to a limited or full extent
- No plan to apply / not applicable

In contrast, about 40% to half of virtual banks indicate likely adoption of the various marketplace platforms innovations.



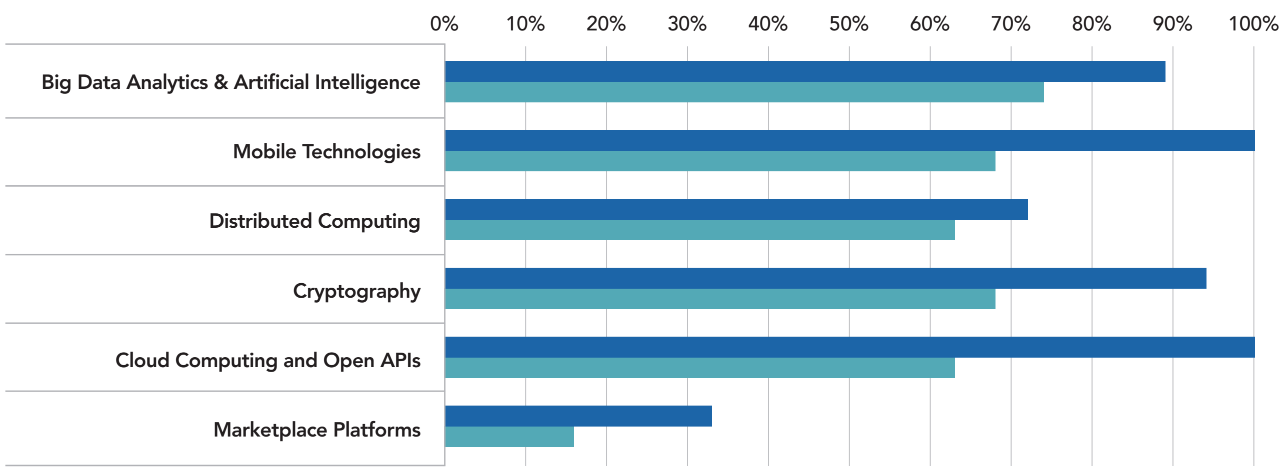
Percentage of virtual bank respondents – Status of Fintech adoption (areas of innovations)
- Already applied partially, and will apply more either to a limited or full extent
- Not yet applied but have plan to apply either to a limited or full extent
- No plan to apply / not applicable

TECHNOLOGY REVOLUTION

BANKS VIEW IT AS AN OPPORTUNITY RATHER THAN A THREAT

RETAIL BANKS ARE MORE KEEN ON FINTECH INNOVATION ADOPTION

Providing a further breakdown of the adoption in major Fintech innovations among incumbent banks into retail and foreign banks, the survey results show that Fintech adoption of retail banks in various innovation areas are generally higher than foreign banks.



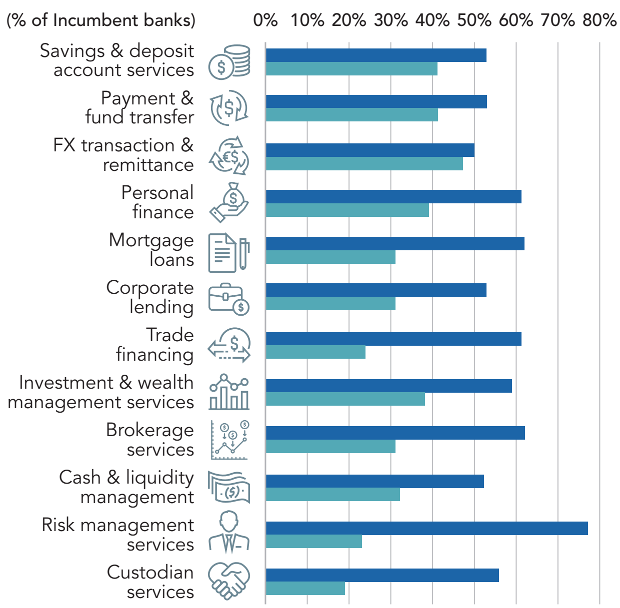
Percentage of respondents that have adopted or plan to adopt innovations in the above areas
- Retail banks
- Foreign banks

TECHNOLOGY REVOLUTION

BANKS VIEW IT AS AN OPPORTUNITY RATHER THAN A THREAT

FINTECH PRESENTING OPPORTUNITIES FOR THE FUTURE

For the next five years, banks expecting Fintech to be an opportunity continue to tangibly outnumber those seeing it as a threat, across all financial services.



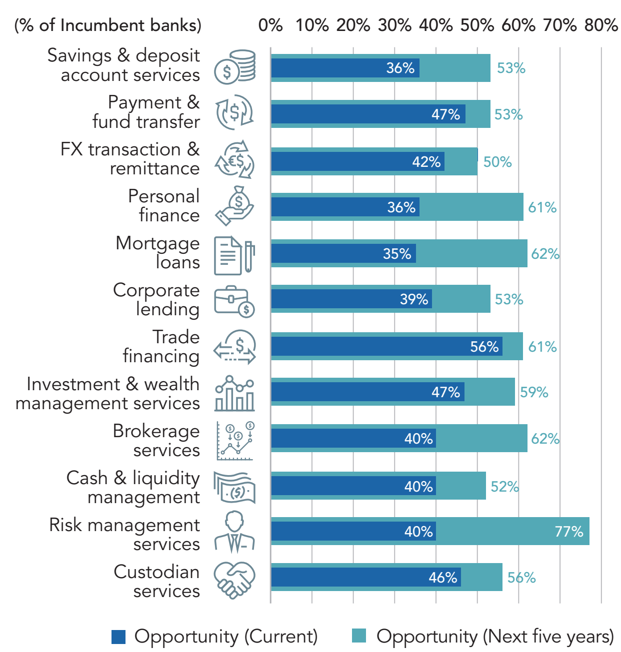
Percentage of respondents – Views on Fintech's impact in the next five years (areas of financial services)

35%–56% of the **incumbent banks** consider **Fintech as an opportunity currently**

50%–77% consider **Fintech as an opportunity in the next five years**

Incumbents view Fintech more as opportunities than threats to their business operations, now and in the future.

Notably, across all financial services, a greater proportion of the incumbent banks consider Fintech as an opportunity in the next five years.



2 HAVE BANKS MET THEIR OBJECTIVES?

SOME EARLY SIGNS OF PAYOFF

Although in general it may appear premature to evaluate the effectiveness of Fintech adoption, there are already some early signs of payoff, with more than a third of the incumbent banks stating that their prime objectives have been met. Preliminary analyses suggest that the adoption of Fintech may have produced some positive effects on banks' performance, in terms of cost efficiency and profitability.

HAVE BANKS MET THEIR OBJECTIVES?

SOME EARLY SIGNS OF PAYOFF

As banks undergo various digitalisation transformations in different business domains, they consider how the objectives of each of their institutions' five most important motivations for adopting Fintech have so far been achieved. About a third of the incumbent banks state that their objectives have been met, while most others consider it premature to evaluate.

Virtual banks indicate that it is premature to evaluate the success of their Fintech adoptions, as they have yet to commence operations at the time of the survey.

Intuitively, the adoption of Fintech and digitalisation transformation should enable banks to improve efficiency, expand customer base and enhance business opportunities. If so, one should generally expect banks which adopt Fintech to a greater extent in their business operations, to register a better performance in their cost efficiency and profitability, other things being equal.

An attempt is made to gauge preliminarily whether incumbent banks have benefited from adopting Fintech in their institutions so far by cross-checking banks' balance sheet data with their survey responses.

Specifically, the relationship is examined between the degree of banks' Fintech adoption and two metrics of bank performance, namely cumulative changes in their cost-to-income ratio and return on assets (ROA).

Initial results show that changes in banks' cost-to-income ratio and ROA are statistically correlated with their Fintech adoption status. A bank with a higher level of Fintech adoption is associated with a larger cumulative decline in its cost-to-income ratio as well as a larger cumulative rise in its ROA, other things being equal.

These preliminary results suggest that the adoption of Fintech has so far produced some positive effects on banks' performance.

HAVE BANKS MET THEIR OBJECTIVES?

SOME EARLY SIGNS OF PAYOFF

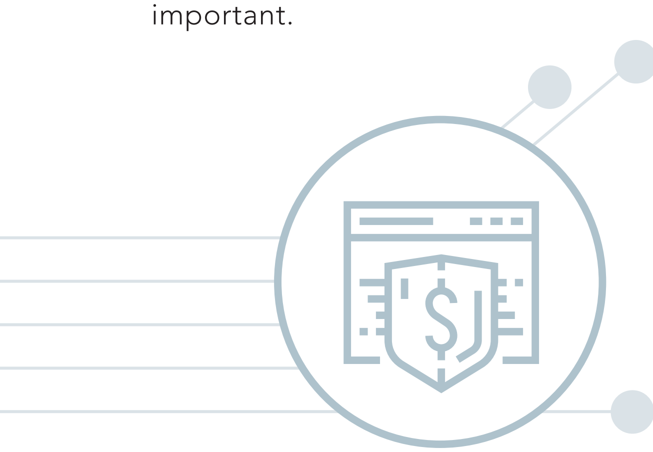
MOTIVATING FACTORS FOR EMBRACING FINTECH

The embracing of Fintech by banks has been motivated by a number of factors. While some banks see the application of Fintech innovations mainly as a means to retain existing customers, reduce cost and improve efficiency, others see it as a key driver for business growth.

Banks are asked to rate a list of possible motivations which could have driven the current adoption, or will drive the future adoption, of Fintech in their institutions.

Most incumbent banks (ranging from over three quarters to 89% of respondents) cite "improve retention of customers", "increase customer base", "improve efficiency", "respond to increased demand for cyber & IT security risks mitigation", and "respond to increased competition" as either important or very important motivations. It is interesting to note that cost-related motivations like "reduce staff cost", and "reduce overhead & rental costs" are considered by relatively less respondents (57% and 35% respectively) as so.

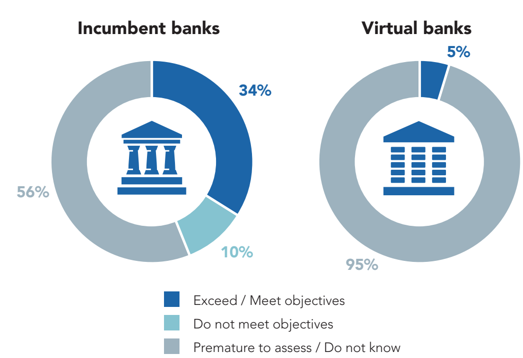
With the exception of "revamp legacy IT infrastructure", virtual banks generally consider all listed motivations as either important or very important.



There are some early signs of payoff, with more than one third of incumbent banks stating that their prime objectives have been met.

HAVE THE OBJECTIVES BEEN MET?

Banks considered how the objectives of each of their institutions' five most important motivations for adopting Fintech have so far been achieved. About 34% of incumbent banks state that their objectives have been met, while most others consider it premature to evaluate. Only a few respondents indicate that they have failed to meet their objectives. Virtual banks indicate that it is premature to evaluate the success of their Fintech adoptions, as they have yet to commence operations at the time of the survey.



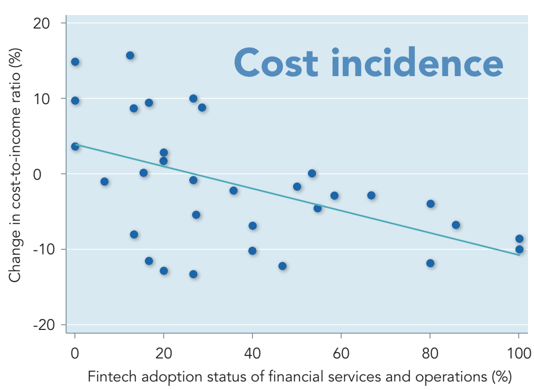
HAVE BANKS MET THEIR OBJECTIVES?

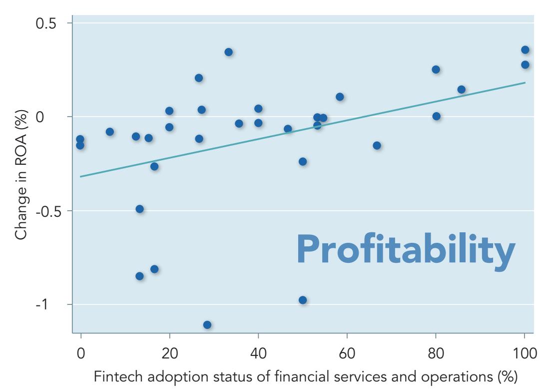
SOME EARLY SIGNS OF PAYOFF

PRELIMINARY SUGGESTIONS OF FINTECH'S POSITIVE EFFECTS ON BANKS' PERFORMANCE

A preliminary attempt is made to gauge whether incumbent banks have benefitted from adopting Fintech by examining the relationship between Fintech adoption and changes in banks' cost-to-income ratio and return on assets (ROA).

Initial results show that changes in banks' cost-to-income ratio and ROA are statistically correlated with their Fintech adoption status. A bank with a higher level of Fintech adoption is associated with a larger cumulative decline in its cost-to-income ratio as well as a larger cumulative rise in its ROA, other things being equal.





These preliminary results suggest that the adoption of Fintech has so far produced some positive effects on banks' performance[1]. For further details, please refer Appendix B.

[1] Caution should be exercised when interpreting the estimation results as some factors, other than Fintech adoption, could also affect the cost-to-income ratio and ROA of banks during the period under study.

3 FINTECH STRATEGY AND IMPLEMENTATION

MOST BANKS SEE THEMSELVES AS "ADOPTERS" INSTEAD OF "FOLLOWERS"

Most banks take either a "proactive adopters" approach to achieve first mover's advantage or a "reactive adopters" strategy where transformational changes are implemented at a steady pace, rather than going with the flow and engaging in Fintech only when the technologies are more mature and widely adopted or not dealing with Fintech at all.

FINTECH STRATEGY AND IMPLEMENTATION

MOST BANKS SEE THEMSELVES AS "ADOPTERS" INSTEAD OF "FOLLOWERS"

Developing Fintech innovations is a complex task, which involves, among other things, setting innovation strategies that align with the key objectives of the institution. For many global banks, it is particularly important that banks' management communicates the strategic vision clearly and executes the innovation plan effectively across various jurisdictions and business functions.

Most incumbent banks have either a centralised Fintech division or decentralised Fintech teams, with a small percentage of them handling Fintech-related matters on an ad-hoc basis. For virtual banks, half of them have centralised Fintech teams, and the remaining half, decentralised ones.

While most retail and virtual banks have their Fintech teams located in Hong Kong, only one quarter of the foreign banks set up Fintech teams locally, partly reflecting their headquarters' centralised approach.

Amid the rapid development in financial technologies, banks explore various forms of engagement to accelerate their Fintech development. In general, banks lacking in-house innovation expertise may be more inclined to form partnerships with Fintech firms to accelerate the process, while their counterparts which possess sufficient technological resources prefer to develop their capacity internally. Banks may even purchase Fintech solutions from external parties to avoid long research and development processes.

For both incumbent banks and virtual banks, "purchase Fintech products and services from external parties" and "develop in-house" are the two most popular forms of engagement undertaken for Fintech development.

Other forms of engagement undertaken by about half of the incumbent banks include forming commercial partnerships with Fintech firms or non-commercial partnerships through incubator programmes and sponsored innovation hubs, or setting up internal accelerators and innovation labs.

Banks' strategies towards Fintech is the key factor that influences the pace and degree of Fintech development in the institutions.

More than 85% of the incumbent banks consider themselves as either "proactive adopters" or "reactive adopters", while only a few see themselves as "passive adopters" which only engage in Fintech projects when the technologies are more mature and widely adopted. The proportion of retail banks considering themselves "proactive adopters" is higher than that of foreign banks. There are no banks which do not deal with Fintech at all.

Perhaps as expected, nearly all virtual banks consider themselves as "proactive adopters".

FINTECH STRATEGY AND IMPLEMENTATION

MOST BANKS SEE THEMSELVES AS "ADOPTERS" INSTEAD OF "FOLLOWERS"

BANKS' INTERNAL ORGANISATION FOR FORMULATING FINTECH STRATEGIES

In Hong Kong, most of the incumbent banks have either a centralised Fintech division (62%), where a dedicated innovation committee or Fintech task force established at the group level is responsible for planning and implementing Fintech projects for the whole banking group, or a decentralised Fintech team (26%), where smaller and specific Fintech teams are established for different business lines or jurisdictions, focusing on developing specific innovation strategies that best suit their own needs.

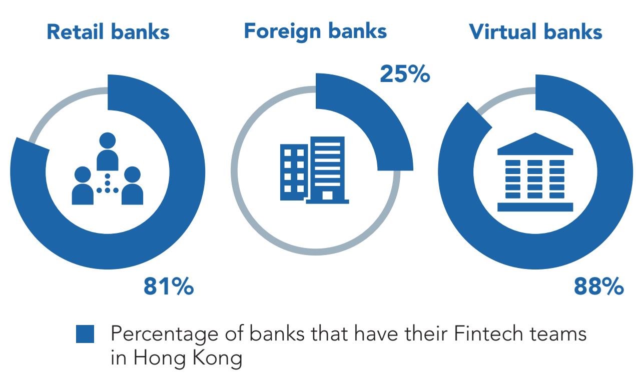
Only a small percentage of the respondents (13%) have no dedicated Fintech team and handle Fintech matters on an ad-hoc basis.

Virtual banks plan to establish either a centralised Fintech division (50%) or decentralised Fintech teams (50%).

Most retail and virtual banks have or plan to set up dedicated Fintech divisions, mostly located in Hong Kong, though fewer foreign banks have so far established their teams domestically, partly reflecting their headquarters' centralised development approach.

LOCATION OF FINTECH TEAMS FOR BANKS IN HONG KONG

Amongst banks that have either a centralised Fintech division or decentralised Fintech teams, most retail banks (81%) reveal that they have a Fintech team located in Hong Kong, while only a quarter of the foreign banks have set up a team locally. Most virtual banks (88%) indicate that they will establish a Fintech team domestically.



FINTECH STRATEGY AND IMPLEMENTATION

MOST BANKS SEE THEMSELVES AS "ADOPTERS" INSTEAD OF "FOLLOWERS"

FORMS OF ENGAGEMENT FOR FINTECH DEVELOPMENT

Banks have been asked to describe how they engage in Fintech innovations from an identified list of forms of engagement. Across different groups of incumbent banks and virtual banks, "purchase Fintech products and services from external parties" and "develop in-house" are the two most popular forms of engagement adopted for Fintech development, with over 88% and 84% of respondents revealing that these are respectively undertaken by their institutions.

"Purchase Fintech products and services from external parties" and "develop in-house" are the two most popular forms of engagement adopted for Fintech development.

Around 40% to 50% of incumbent banks indicate that they have formed commercial partnerships (e.g. joint ventures) with Fintech firms or non-commercial partnerships through incubator programmes and sponsored innovation hubs, or have set up internal accelerators and innovation labs.

Direct investment in Fintech firms, including "direct acquisition of existing Fintech firms" and "set up venture funds to invest in Fintech start-ups", is a less adopted form of engagement by banks in Hong Kong.

FINTECH STRATEGY AND IMPLEMENTATION

MOST BANKS SEE THEMSELVES AS "ADOPTERS" INSTEAD OF "FOLLOWERS"

CHALLENGES OF PARTNERING WITH FINTECH FIRMS

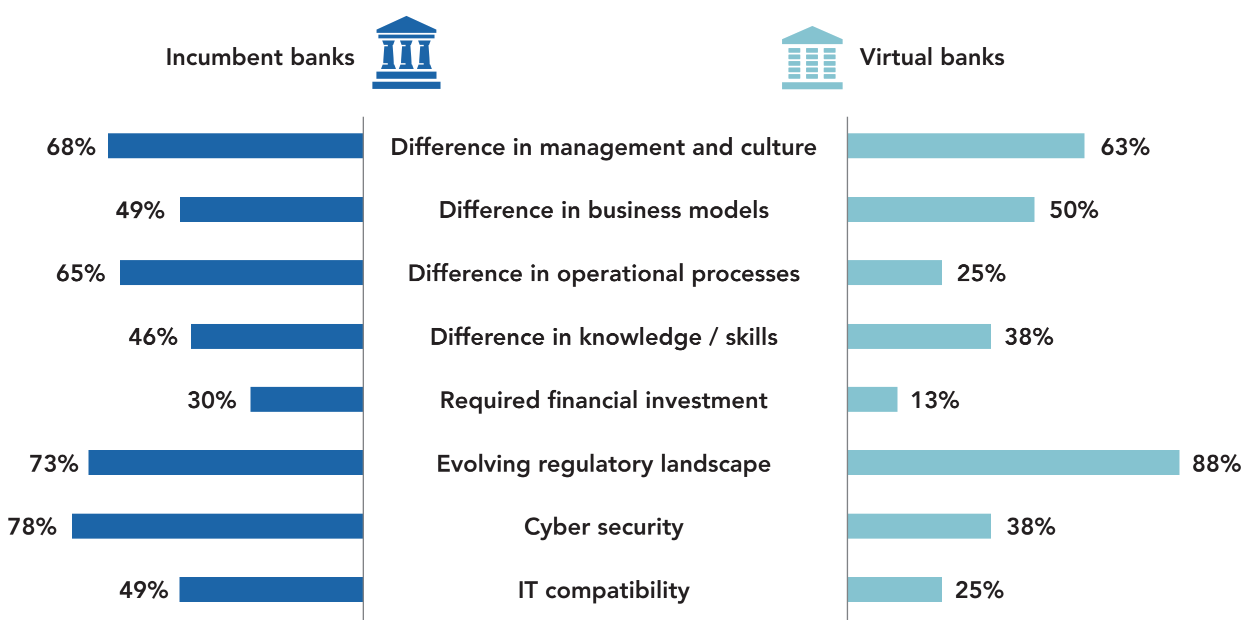
While forming partnerships with Fintech firms could theoretically bring benefits to banks and Fintech firms, several factors may pose challenges to this type of collaboration between the two parties in practice.

These factors often stem from fundamental differences between banks and Fintech firms in terms of their business models, IT compatibility, management and culture, and skill sets. In addition, evolving regulatory landscape is another key challenge. Banks and Fintech firms are subject to different regulatory requirements which would evolve along with Fintech developments. The regulatory landscape could also evolve in many other areas, such as requirements concerning data privacy and protection issues as well as differences in regulatory treatments across jurisdictions.

Moreover, since incumbent banks handle sensitive customer information, cybersecurity risk arising from bank-Fintech firm partnerships (such as threats from virus and cyber-attacks that may result in the loss of customer data) is another key concern for banks, particularly regarding those Fintech firms with inadequate track records of their data and IT security.

In general, most incumbent banks (65% to 78% of respondents) indicate that "cybersecurity", "evolving regulatory landscape", "difference in management and culture" and "difference in operational processes" are the major challenges[2] faced when partnering with Fintech firms.

As for virtual banks, while "evolving regulatory landscape" and "difference in management and culture" are also considered as key challenges, only a small fraction of them considers "cybersecurity" and "difference in operational processes" as such when collaborating with Fintech firms.



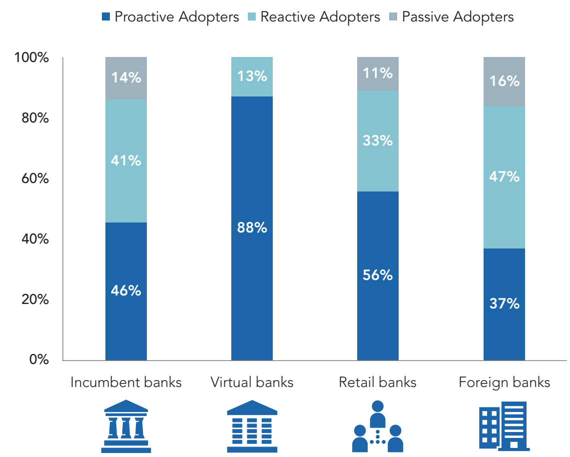
2 The challenges of partnering with Fintech firms identified by respondents would serve as a useful frame of reference for future investigations into the specific reasons.

FINTECH STRATEGY AND IMPLEMENTATION

MOST BANKS SEE THEMSELVES AS "ADOPTERS" INSTEAD OF "FOLLOWERS"

BANKS' STRATEGIES TOWARDS FINTECH DEVELOPMENT

Banks can be broadly classified according to their strategies as proactive adopters that have focused transformation projects and are actively investing in Fintech to achieve first-mover advantage; reactive adopters that take a pragmatic approach and implement transformational changes at a steady pace; passive adopters that take a 'go with the flow' approach and only engage in Fintech projects when the technologies are more mature and widely adopted; or banks which do not deal with Fintech at all.



Most banks take either a "proactive adopters" approach to achieve first mover's advantage or a "reactive adopters" strategy where transformational changes are implemented at a steady pace, rather than going with the flow.

ACTIVE ENGAGEMENT IN FINTECH DEVELOPMENT BY THE HONG KONG BANKING INDUSTRY

Most incumbent banks consider themselves as either "proactive adopters" (46%) or "reactive adopters" (41%), while only a few see themselves as "passive adopters". Across the respondents, the proportion of retail banks consider themselves "proactive adopters" is relatively higher than that of foreign banks, in line with the observation that applications of Fintech innovations amongst foreign banks are less widespread than retail banks. It is also worth noting that all incumbent banks are developing their own strategies for Fintech development, with none indicating that they do not deal with Fintech at all.

Consistent with the earlier finding that virtual banks have shown keen interest to apply a wider range of Fintech solutions, nearly all virtual banks consider themselves as "proactive adopters".

4 OVERCOMING CHALLENGES

INFORMATION SECURITY, TALENTS, REGULATION RELATED TO FINTECH EVOLUTION AND LEGACY IT SYSTEMS ARE KEY

Difficulties in ensuring information security, data privacy and protection, difficulties in retaining and attracting highly skilled talent, domestic as well as international regulation related to Fintech evolution, and banks' legacy IT systems, are considered as key challenges by most banks. These are not unique to Hong Kong and can also be seen in the banking industries of other economies. For some of these hurdles, policymakers could have a role to play.

OVERCOMING CHALLENGES

INFORMATION SECURITY, TALENTS, REGULATION RELATED TO FINTECH EVOLUTION AND LEGACY IT SYSTEMS ARE KEY

About three quarters to over 80% of the incumbent banks rate "difficulties in ensuring information security, data privacy and protection", "difficulties in retaining and attracting the right talents", and "regulation related to Fintech evolution", as either important or very important challenges to their Fintech development, while about two thirds of the incumbent banks rate "difference in regulatory standards across different jurisdictions" and "legacy IT systems" similarly.

Amongst incumbent banks, a larger share of the respondents from the foreign bank group considers "difference in regulatory standards across different jurisdictions" as important or very important than respondents from the retail bank group. More retail banks appear concerned with "customer scepticism in using Fintech solution" than foreign bank respondents.

For virtual banks, their responses are similar to incumbent banks. While they all consider "regulation related to Fintech evolution" as a key challenge, understandably, only 25% of them see "legacy IT systems" as an important or very important challenge.

These challenges are not specific to Hong Kong and can also be seen in the banking industries of other economies. To deal with some of these hurdles, policy makers could have a role to play.

The HKMA has introduced a number of initiatives with an aim to address some related issues. These include, but are not limited to, Fintech Supervisory Sandbox, Cybersecurity Fortification Initiative, Fintech Career Accelerator Scheme, Banking Made Easy Initiative and Cross-border Collaborations. The HKMA has also provided a number of guidelines and recommendations to the banking industry related to Fintech, in view of the evolving regulatory landscape.

Fintech Supervisory Sandbox

- Allowing banks and their partnering Fintech firms to conduct pilot trials of their Fintech initiatives involving a limited number of participating customers without the need to achieve full compliance with HKMA's supervisory requirements

Cybersecurity Fortification Initiative

- Raising the cyber resilience of Hong Kong's banking system

Fintech Career Accelerator Scheme

- Aiming to nurture talents to meet the growing needs for Fintech talents

Banking Made Easy Initiative

- Reducing regulatory frictions hindering technological innovations

Cross-border Collaborations

- Stepping up cross-border collaborations with different jurisdictions in respect of Fintech development

OVERCOMING CHALLENGES

INFORMATION SECURITY, TALENTS, REGULATION RELATED TO FINTECH EVOLUTION AND LEGACY IT SYSTEMS ARE KEY

CHALLENGES FOR FINTECH DEVELOPMENT

Despite vast interests and growing adoption of Fintech by banks around the world, challenges remain that hinder the development of Fintech by banks. These include customer scepticism in using Fintech solution, regulatory-related matters in relation to Fintech both locally and internationally, inflexibility of integrating Fintech solutions due to banks' legacy IT systems, difficulties in ensuring cybersecurity and data protection, difficulties in obtaining required funding for Fintech innovation and difficulties in attracting the right talents.

To gain further insights, respondents are asked to rate factors that may hinder future Fintech development in their banks, with reference to a list of challenges as identified by the literature.

Information security, data privacy and protection, talent retention and attraction, domestic and international regulatory-related matters relating to Fintech, and banks' legacy IT systems, are considered key challenges.

OVERCOMING CHALLENGES

INFORMATION SECURITY, TALENTS, REGULATION RELATED TO FINTECH EVOLUTION AND LEGACY IT SYSTEMS ARE KEY

KEY CHALLENGING FACTORS FOR INCUMBENT BANKS AND VIRTUAL BANKS

About three quarters to over 80% of the incumbent banks rate "difficulties in ensuring information security, data privacy and protection", "difficulties in retaining and attracting the right talents", and "regulation related to Fintech evolution", as either important or very important challenges[3] to their Fintech development, while about two thirds of incumbent banks rate "difference in regulatory standards across different jurisdictions" and "legacy IT systems" as such.

Virtual banks' responses are quite similar to incumbent banks. While they all consider "regulation related to Fintech evolution" as a key challenge, understandably, only 25% of them see "legacy IT systems" as an important or very important challenge.

Share of respondents (%)	Incumbent banks			Virtual banks		
	Very Important/ Important	Somewhat important	Not important/ Not applicable	Very Important/ Important	Somewhat important	Not important/ Not applicable
Customer scepticism regarding services empowered by Fintech solutions	41	35	24	50	50	0
Regulation related to Fintech evolution	73	19	8	100	0	0
Difficulties in obtaining required funding for Fintech development	41	35	24	38	25	38
Difficulties in retaining and attracting the right talents	76	19	5	88	0	13
Difficulties in ensuring information security, data privacy and protection	84	14	3	75	13	13
Legacy IT infrastructure	65	30	5	25	25	50
Over-reliance on external service providers	38	46	16	25	13	63
Difference in regulatory standards across different jurisdictions	65	27	8	75	25	0

KEY CHALLENGING FACTORS FOR FOREIGN BANKS AND RETAIL BANKS

Amongst incumbent banks, a larger share of the respondents (74%) from the foreign bank group consider "difference in regulatory standards across different jurisdictions" as important or very important than respondents (56%) from the retail bank group.

It is worth noting that more retail banks (56%) appear concerned with "customer scepticism in using Fintech solution" than foreign bank respondents (26%).

Share of respondents (%)	Foreign banks			Retail banks		
	Very Important/ Important	Somewhat important	Not important/ Not applicable	Very Important/ Important	Somewhat important	Not important/ Not applicable
Customer scepticism regarding services empowered by Fintech solutions	26	42	32	56	28	17
Regulation related to Fintech evolution	63	26	11	83	11	6
Difficulties in obtaining required funding for Fintech development	37	42	21	44	28	28
Difficulties in retaining and attracting the right talents	68	26	5	83	11	6
Difficulties in ensuring information security, data privacy and protection	84	11	5	83	17	0
Legacy IT infrastructure	58	37	5	72	22	6
Over-reliance on external service providers	32	53	16	44	39	17
Differences in regulatory standards across different jurisdictions	74	21	5	56	33	11

3 The challenges on Fintech identified by respondents would potentially serve as a useful frame of reference for future research.

OVERCOMING CHALLENGES

INFORMATION SECURITY, TALENTS, REGULATION RELATED TO FINTECH EVOLUTION AND LEGACY IT SYSTEMS ARE KEY

POLICY INITIATIVES TO FACILITATE FINTECH ADOPTIONS

To deal with some of these hurdles, the policy makers could have a role to play. The HKMA has introduced several initiatives with the aim of addressing some related issues. These include:

(i) introduction of the Fintech Supervisory Sandbox that allows banks and their partnering Fintech firms to conduct pilot trials of their Fintech initiatives, involving a limited number of participating customers, without the need to achieve full compliance with HKMA's supervisory requirements;

(ii) launch of Cybersecurity Fortification Initiative with a view to raising the cyber resilience of Hong Kong's banking system;

(iii) launch of the Fintech Career Accelerator Scheme aiming to nurture talents to meet the growing needs for Fintech talents;

(iv) introduction of the Banking Made Easy Initiative to reduce regulatory frictions hindering technological innovations and to improve customer experience[4]; and

(v) stepping up Cross-border Collaborations with different jurisdictions in respect of Fintech development.

In addition, the HKMA has provided a number of guidelines and recommendations to the banking industry on various issues, such as consumer data protection[5], in view of the evolving regulatory landscape[6].

The HKMA will continue to engage with and solicit feedbacks from the banking industry and international regulatory bodies in exploring different ways to further facilitate Fintech adoption by banks in Hong Kong.

[4] As Fintech innovation is also increasingly adopted in many financial services other than banking services, the interplay between different agencies and authorities in this context becomes increasingly relevant.

[5] The HKMA, in collaboration with the Hong Kong Association of Banks (HKAB), has been engaging with the Office of the Privacy Commissioner for Personal Data (PCPD) to provide more guidance to banks on the proper use of personal data in the online environment.

[6] For instance, in view of the growing risk management and consumer data protection challenges for banks in deploying Artificial Intelligence applications, the HKMA has recently introduced two circulars, namely *"High-level Principles on Artificial Intelligence circular" and "Consumer Protection in respect of Use of Big Data Analytics and Artificial Intelligence (BDAI) by authorised Institutions circular"*, to provide guiding principles to banks in adopting AI technologies. For details, see https://www.hkma.gov.hk/media/eng/doc/key-information/guidelines-and-circular/2019/20191101e1.pdf and https://www.hkma.gov.hk/media/eng/doc/key-information/guidelines-and-circular/2019/20191105e1.pdf respectively.


FINTECH

5 LOOKING INTO THE FUTURE

MOST BANKS ARE CONFIDENT THAT THEY WILL CONTINUE TO PLAY A KEY ROLE IN CUSTOMER RELATIONSHIP AND CORE BANKING SERVICES IN THE NEXT 10 YEARS

Over a 10-year time horizon, incumbent banks on the whole seem confident that, through adapting to the new environment, they will continue to play a key role and would not be displaced by new competitors. Whilst they consider the "better bank scenario" where banks digitise and modernise themselves to retain the customer relationship and core banking services, leveraging enabling technologies to change their current business models, as either possible or highly possible, they do not rule out other less but still dramatic scenarios.

Virtual banks expect a bigger impact of Fintech on traditional banking services and a more dramatic change in the structure of Hong Kong's banking industry.

If banks' views are any guide, precautionary preparations for more dramatic changes in Hong Kong's banking industry structure are probably warranted.

LOOKING INTO THE FUTURE

MOST BANKS ARE CONFIDENT THAT THEY WILL CONTINUE TO PLAY A KEY ROLE IN CUSTOMER RELATIONSHIP AND CORE BANKING SERVICES IN THE NEXT 10 YEARS

To gain insights into how the banking industry of Hong Kong may evolve in the face of Fintech development in the future, banks are asked for their views on how likely each of the five scenarios proposed in a consultative exercise by the Basel Committee on Banking Supervision, may materialise in Hong Kong in ten years' time.

Whilst all surveyed incumbent banks consider the "better bank scenario" as either highly possible or possible, they appear not to rule out other less but still dramatic scenarios like the "relegated bank scenario" where banks become commoditised service providers and customer relationships are owned by new intermediaries, such as Fintech firms, and the "distributed bank scenario", where banks and Fintech firms operate as joint ventures, partners or other structures where the delivery of financial services is shared across parties.

As for virtual banks, while most of them consider the "better bank scenario" as highly possible, half of the respondents also see the "distributed bank scenario" and the "new bank scenario" where traditional banks are replaced by new technology-driven banks, such as neo-banks, or banks instituted by Fintech firms, with full service "built-for-digital" banking platforms, as highly possible.

This suggests that virtual banks in general expect greater impact of Fintech innovations on traditional banking services and a more dramatic change in the structure of Hong Kong's banking industry.

If the banks' views are any guide, precautionary preparations for more dramatic changes in Hong Kong's banking industry structure, such as strengthened monitoring on the Fintech development as well as increased cooperation with different authorities responsible for oversight of regulatory functions related to Fintech, may be warranted.

LOOKING INTO THE FUTURE

MOST BANKS ARE CONFIDENT THAT THEY WILL CONTINUE TO PLAY A KEY ROLE IN CUSTOMER RELATIONSHIP AND CORE BANKING SERVICES IN THE NEXT 10 YEARS

FINTECH SHAPING THE FUTURE BANKING LANDSCAPE

Banks provided their views on the likelihood of each of the five scenarios (given below) proposed in a consultative exercise by the Basel Committee on Banking Supervision materialising in Hong Kong in ten years' time.

73% and **63%** of **the incumbent** and **virtual banks** consider the **better** bank scenario as **highly possible**

BETTER BANK SCENARIO

Banks digitise and modernise themselves to retain the customer relationship and core banking services, leveraging enabling technologies to change their current business models.

DISINTERMEDIATED BANK SCENARIO

Banks will no longer be a significant player in the intermediation market as customers interact directly with Fintech services providers.

DISTRIBUTED BANK SCENARIO

Financial service become increasingly modularised, while banks focus on providing specific niche financial service. Banks and Fintech firms operate as joint ventures, partners or other structures where the delivery of financial services is shared is shared across parties.

RELEGATED BANK SCENARIO

Banks become commoditised service providers and customer relationships are owned by new intermediaries, such as Fintech firms. The Fintech firms employ front-end customer platforms to offer a variety of financial services and they use banks for their banking licences to provide core commoditised banking services such as lending, deposit-taking and other banking activities.

NEW BANK SCENARIO

Traditional banks are replaced by new technology-driven banks, such as neo-banks, or banks instituted by Fintech firms, with full service "built-for-digital" banking platforms.

LOOKING INTO THE FUTURE

MOST BANKS ARE CONFIDENT THAT THEY WILL CONTINUE TO PLAY A KEY ROLE IN CUSTOMER RELATIONSHIP AND CORE BANKING SERVICES IN THE NEXT 10 YEARS

INCUMBENT BANKS ARE CONFIDENT BUT REMAIN AWARE OF OTHER POSSIBLE BANKING SCENARIOS

Over a 10-year time horizon, incumbent banks on the whole seem confident that, through adapting to the new environment, they will continue to play a key role and would not be displaced by new competitors. The incumbents consider the "better bank scenario" as either highly possible (73% of them) or possible (27%), consistent with earlier findings that banks view Fintech as a complement. In contrast, 65% of them rate the "disintermediated bank scenario" as either unlikely (41%) or less possible (24%).

It is worth noting that incumbent banks are not ruling out other less but still dramatic scenarios. Many incumbents consider the "relegated bank scenario" (57%), "distributed bank scenario" (57%) and "new bank scenario" (46%) as possible.

Whilst all incumbent banks consider the "better bank scenario" as either highly possible or possible, they do not rule out other less but still dramatic scenarios like the "relegated bank scenario" and the "distributed bank scenario".

VIRTUAL BANKS EXPECT GREATER FINTECH IMPACT ON FUTURE BANKING INDUSTRY STRUCTURE

While most virtual banks (63% of respondents) consider the "better bank scenario" as highly possible, half of them also see the "distributed bank scenario" and the "new bank scenario" highly possible.

This suggests that virtual banks in general expect a bigger impact of Fintech innovations on traditional banking services and a more dramatic change in the structure of Hong Kong's banking industry.

PRECAUTIONARY PREPARATIONS PROBABLY WARRANTED

If the banks' views are any guide, precautionary preparations for more dramatic changes in Hong Kong's banking industry structure, such as strengthened monitoring on the Fintech development as well as increased cooperation with different authorities responsible for oversight of regulatory functions related to Fintech, may be warranted.

CONCLUSIONS

The technology revolution is embraced by the financial services industry, with Fintech viewed as a complement and enabling technology by the Hong Kong banking industry. Fintech innovations have been applied widely across all financial services by incumbent banks, particularly in the areas of payment and fund transfer, personal finance, savings and deposit account services, investment and wealth management services, back-office operations and IT security systems.

The incumbent banks have made tangible efforts to apply financial technologies and intend to apply them to a greater extent in the future. Most of them have taken a pragmatic approach, adopting a wide range of Fintech innovations across financial services whilst eschewing applications of marketplace platforms that could facilitate a shift to disintermediation.

Overall, incumbent banks viewing Fintech as an opportunity out-number those seeing it as a threat to their existing businesses currently and in the next five years. Notably, a higher proportion of them see Fintech as presenting opportunities across all financial services in the future compared to now.

Although it may appear premature to evaluate the effectiveness of Fintech adoption, there are already some early signs of payoff, with more than a third of the incumbent banks stating that their prime objectives have been met. Preliminary research suggests that the adoption of Fintech may have produced some positive effects on banks' performance.

Most banks take either a "proactive adopters" approach to achieve first mover's advantage or a "reactive adopters" strategy where transformational changes are implemented at a steady pace. To that end, most retail and virtual banks have or plan to set up dedicated divisions or teams, mostly located in Hong Kong, though fewer foreign banks have done so domestically, partly reflecting the centralised development approach taken at their headquarters. To accelerate the adoption of Fintech innovations, various forms of engagement in relation to Fintech have been undertaken.

The pace and degree of Fintech adoption will, however, hinge on whether certain challenges can be overcome, which include difficulties in ensuring information security, data privacy and protection, talent attraction and retention, domestic as well as international regulation related to Fintech evolution, and banks' legacy IT systems. These challenges are not unique to Hong Kong and can also be seen in the banking industries of other economies. The HKMA has introduced several initiatives with the aim of addressing some related issues. It has also provided a number of guidance and recommendations to the banking industry related to Fintech applications, in view of the evolving regulatory landscape.

How Hong Kong's banking industry structure may evolve in the face of Fintech development has been widely debated. **Over a ten-year time horizon, incumbent banks seem confident that, through adapting to the new environment, they continue to play a key role in the industry.** Nonetheless, they do not to rule out other less but still dramatic scenarios. Virtual banks generally expect a bigger impact of Fintech on traditional banking services and a more dramatic change in the structure of Hong Kong's banking industry. If banks' views are any guide, precautionary preparations for more dramatic changes in Hong Kong's banking industry structure, such as strengthened monitoring on the Fintech development as well as increased cooperation with different authorities responsible for oversight of regulatory functions related to Fintech, may be warranted.

APPENDIX A

SURVEY BACKGROUND

The results presented in this report are based on a survey entitled "Study of the Impact of Fintech Innovations on the Hong Kong Banking Industry", conducted in July 2019 to obtain sector-wide qualitative information from market participants and to gather insights into the important trends and evolution of Fintech development in the Hong Kong banking industry.

In total, 45 authorised institutions participate in the survey[7]. A sample of 37 incumbent banks is constructed to cover a broad representation of market players, with respect to types of banks and business activities. In the sample, 18 of them are retail banks[8] and the remaining 19 of them are major foreign bank branches (hereafter denoted as foreign banks), whose parents are either globally systemic important institutions or Chinese banks. The 37 incumbent banks together account for around three quarters of total assets and over 80% of total customer deposits in the Hong Kong banking industry as of the end of June 2019. In addition, 8 virtual banks which have recently obtained banking licences are also covered by the survey.

45 authorised institutions participated in the survey

37 incumbent banks accounting for **around three quarters** of total assets and **over 80%** of total customer deposits in the Hong Kong banking industry as of the end of June 2019

18 retail banks

19 foreign banks

8 virtual banks which have recently obtained banking licences and plan to start operation soon

[7] To supplement information collected from the survey, the views from Stored Value Facility licensees (SVFs) on related issues are also collected.

[8] The term "retail banks" used in this report follows the HKMA's definition, which generally include (i) all locally incorporated banks plus (ii) a number of the larger foreign banks whose operations are similar to those of the locally incorporated banks in that they operate a local branch network and are active in retail banking business.

APPENDIX A

SURVEY BACKGROUND

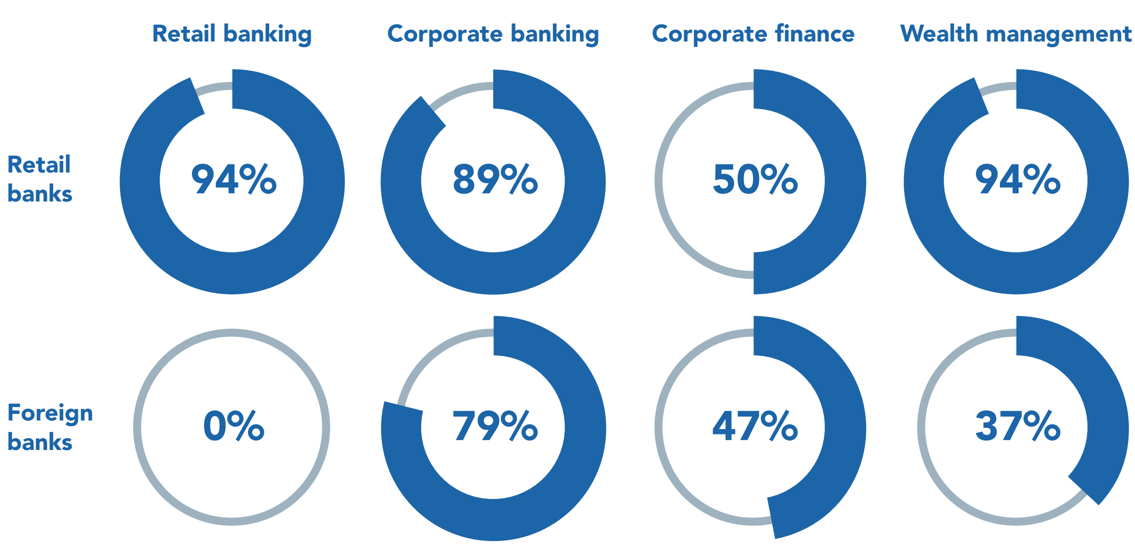
MAJOR BUSINESS OPERATIONS OF RESPONDENTS BY BANK TYPE

In general, the incumbent banks (i.e. retail banks and foreign banks) have engaged in a diversity of banking services in Hong Kong, with over 40% of them considering corporate banking, wealth management and retail banking as their main businesses.

For virtual banks, while they have not yet begun operations in Hong Kong, they indicate that the focus of their businesses will be on retail banking, while some virtual banks reveal that SME lending will also be their major business operation in Hong Kong.

Note: For incumbent banks, "Others" covers mainly insurance and safe deposit box services. For virtual banks, "Others" primarily refers to SME lending.

Among the incumbent banks, retail banks generally provide a wider range of financial services, ranging from retail banking, wealth management and corporate banking to corporate finance. By contrast, most foreign banks focus on corporate banking and corporate finance, while none of them consider retail banking as their main business.



For a more detailed breakdown of the survey results, see Wong and Ho (2020), "The Impact of Fintech innovations on the Hong Kong Banking Industry", HKIMR working paper No. 8/2020.

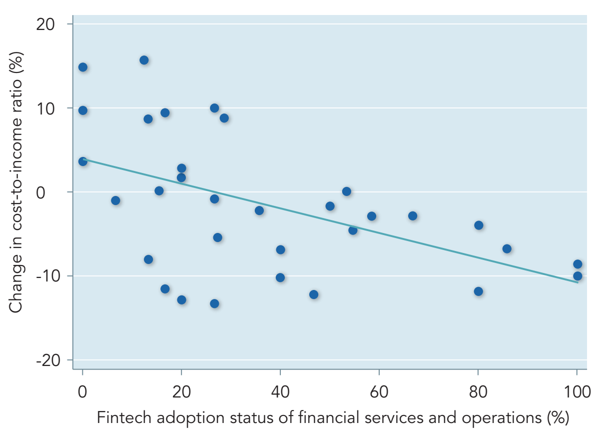
APPENDIX B

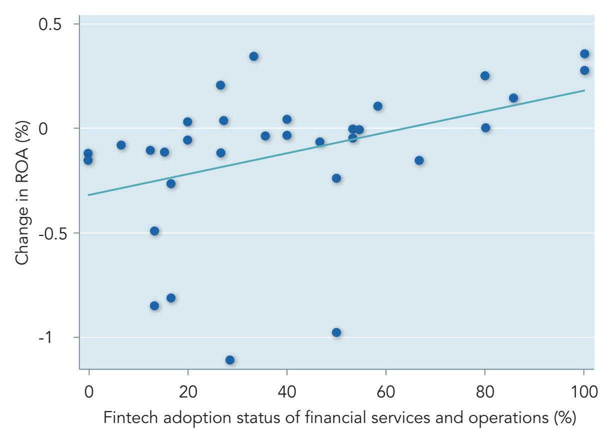
THE EFFECT OF FINTECH ADOPTION ON BANKS' PERFORMANCE — A PRELIMINARY ANALYSIS

To gauge the preliminary effects of banks' Fintech adoption, the relationships between the degree of banks' Fintech adoption and two metrics of bank performance, namely cumulative changes in their cost-to-income ratio and return on assets (ROA), over the period from 2017Q1 to 2019Q2 are examined.[9] The former metric is a commonly used indicator to proxy the cost efficiency of banks, while the latter measures banks' profitability.

The balance sheet data of banks are obtained from the HKMA regulatory database and reflect their Hong Kong office positions. To measure the degree of Fintech adoption in a bank, the bank's Fintech adoption status is calculated by the share of financial services and operations of the bank that has already applied Fintech innovations, with a value of 100% indicating that the bank has adopted Fintech applications across all of its financial services and operations.

Two scatter plots between banks' Fintech adoption status and changes in their cost-efficiency and profitability are plotted respectively.[10] Each dot in the charts represents the observation of a specific bank. It is found that for banks that have already adopted Fintech for a wider range of their businesses and operations, they have registered a larger cumulative reduction in their cost-to-income ratio and a bigger rise in ROA.





9 Cumulative changes are used as the fuller effect of Fintech adoption would likely take time to be reflected. Same analyses with alternative time periods have been conducted and the results are qualitatively similar.

10 Virtual banks are not included in the analysis since they have not yet commenced operation and therefore do not have any balance sheet data.

APPENDIX B

THE EFFECT OF FINTECH ADOPTION ON BANKS' PERFORMANCE — A PRELIMINARY ANALYSIS

A simple ordinary least squares model is also employed by regressing the two performance measures on banks' Fintech adoption status[11]. In this exercise, any impacts that may arise from differences in banks' size (proxied by log assets), business characteristics (proxied by banks' loans-to-assets ratio and deposits-to-assets ratio) and bank group (proxied by a dummy variable which takes a value of one if a bank is a retail bank and zero otherwise) are controlled and separated.

The estimation results show that changes in banks' cost-to-income ratio and ROA are statistically correlated with their Fintech adoption status. Specifically, a bank with a higher level of Fintech adoption by 10 percentage points is associated with a larger cumulative decline in its cost-to-income ratio by 1.67 percentage points as well as a larger cumulative rise in its ROA by 0.05 percentage point over the period from 2017Q1 to 2019Q2, other things being equal.[12]

Estimated effects of Fintech adoption on banks' performance

VARIABLES	(1) Δ Cost-to-income ratio	(2) ΔROA
Fintech adoption status	–0.167***	0.005**
	(0.002)	(0.030)
Log assets	2.652**	0.029
	(0.044)	(0.553)
Deposits-to-assets ratio	–0.218*	–0.005
	(0.052)	(0.374)
Loans-to-assets ratio	0.110	0.005
	(0.418)	(0.419)
Dummy variable for retail bank	5.475	0.113
	(0.146)	(0.645)
Constant	–5.095	–0.476
	(0.481)	(0.103)
Observations	33	33
R^2	0.498	0.199

Robust p-value in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

In sum, the result appears to suggest that the adoption of Fintech by banks has so far produced some positive effects on banks' performance. However, it is noteworthy that some factors other than Fintech adoption might contributed to the change in the cost-to-income ratio and ROA of banks during the period under study. Also, with the continuing process of Fintech adoption by banks, new challenges and risks are likely to arise amid the rapidly-evolving development of new technologies which may offset the positive impact of Fintech. Thus, the interpretation of above regression results should be treated with caution and more research on these issues is warranted.

11 To ensure the estimation results are not driven by outliers, the dependent variable is trimmed at the 5th and 95th percentile.

12 Caution should be exercised when interpreting the estimated effects as the actual full impact may differ significantly across banks which crucially depends on the specific Fintech strategy adopted by individual banks as well as type of Fintech innovations being deployed.

ABOUT THE HONG KONG ACADEMY OF FINANCE

The Hong Kong Academy of Finance (AoF) has been established in June 2019 with full collaboration amongst the Hong Kong Monetary Authority, the Securities and Futures Commission, the Insurance Authority and the Mandatory Provident Fund Schemes Authority. The AoF brings together the strengths of the academia, the industry, professional training institutes and the regulatory community to develop financial leadership and promote research collaboration. The mission of the AoF is to serve as a centre of excellence for developing financial leadership and a repository of knowledge in monetary and financial research, including applied research.

ABOUT THE HONG KONG INSTITUTE FOR MONETARY AND FINANCIAL RESEARCH

The Hong Kong Institute for Monetary and Financial Research (HKIMR) was established by the Hong Kong Monetary Authority in August 1999. Since then it has been conducting research in the fields of monetary policy, banking and finance that are of strategic importance to Hong Kong and the Asia region. With the establishment of the AoF in June 2019, the HKIMR undertakes the research activities of the AoF, and its remit is expanded to include applied finance research in cross-sectoral areas, carrying out research projects that are highly relevant to the policy deliberations in Hong Kong, and strategic to the long-term development of the local financial industry.

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