



# Revealing the Promised Land: Synergy for Achieving Financial Excellence

9<sup>th</sup> AUGUST 2017 || Technically Driven. Intrinsically Motivated.



## ELITE BANK

Charles WONG | Ken CHEUNG | Michelle MA

## Price Discrepancy as a Twofold Problem



### Unreliable External Data Sources

**MarketBox** is a warehouse which stores market movement data, and oftentimes reporting errors occurs due to reliance on single external data source



### Wrong Capturing of Spot Price

**MoneyClip** is where price discrepancy can occur due to the inappropriate instructions and inconsistent treatment of how spot price should be taken

Source: Goldman Sachs, Accenture, EY 2016 Capital Markets Report, BCG Global Markets 2017 Report, Elite Bank Analysis

## Crisis Management Team



**Michelle MA**

**Vice President,  
Equity Sales and Trading**

- User Acceptance Testing
- Regulatory Compliance



**Charles WONG**

**Senior Manager,  
Technology and Operations**

- System Surveillance
- Data Integrity Management



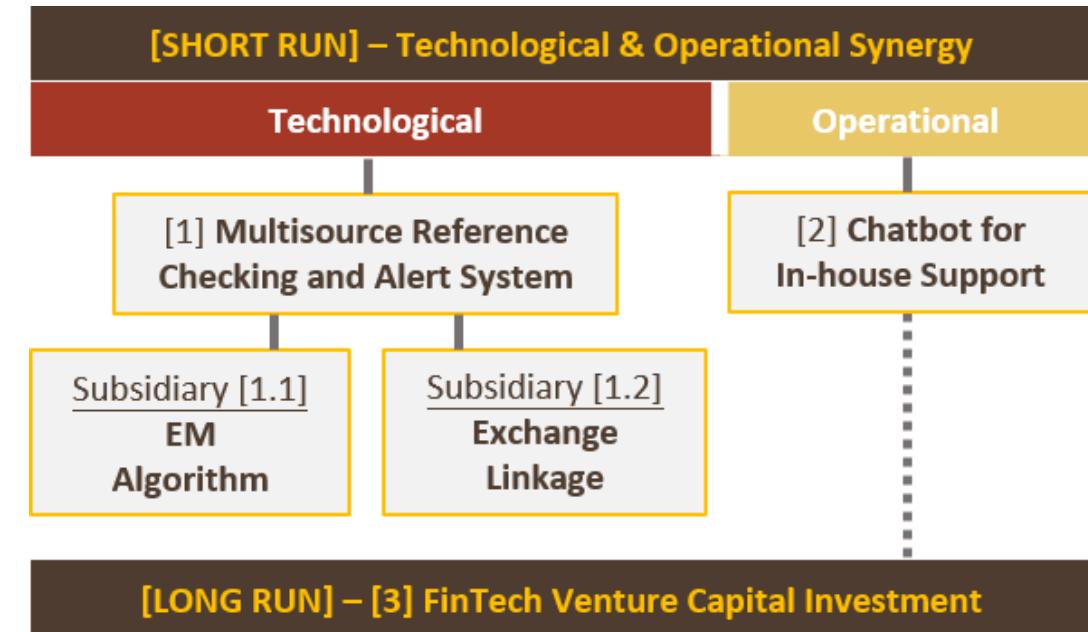
**Ken CHEUNG**

**Senior Manager,  
IT Infrastructure**

- System Automation
- Algorithm Development

Intrinsically Motivated, Technically Driven.

	Problem(s)	Suggested Perspective(s)	Solution(s)	Mitigation Ability
Technological	1	Unreliable External Data Sources	Front-to-Back Trading Cycle Improvement	Multisource Referencing & Alert System
	2	Wrong Capturing of Spot Price	Improvement of Timeliness & Efficiency	EM Algorithm & Exchange Linkage
Operational	3	High Maintenance Manpower Cost	Operational Risk Controls	Chatbot for In-House Support
	4	In-house System Incompetence	Cost Reduction via Offshoring & Outsourcing	FinTech Venture Capital Investment



Source: Morgan Stanley, HKMA, EY 2016 Global banking Outlook, World Economic Forum, Elite Bank Analysis

# [1] Multisource Reference Checking and Alert System



## Purpose and Rationale

Price discrepancy risk is not mitigated if Elite Bank continues to lean on single data source for compiling daily profit and loss. To capture a more accurate market price, it is advisable to have at least one more market data source for comparison purpose.

Cross-checking is therefore necessary to confirm the data accuracy, especially during the market-close period.



## Global Securities Databases with Most Subscriptions



DOW JONES

Whenever there is a price discrepancy among databases, the alert system will be triggered and corrective actions must be taken.

## Harvard Business Review Industrial News



Trading Speed for Jeopardy: 2012 Knight Capital Trading Disruption

The 2012 Knight Capital Incident in U.S. related to the deployment of untested trading software to which contained an obsolete function, causing \$400 million expense in an attempt to stay in business after the trading error.



Source: Societe Generale Group Analysis, Financial Times, Forbes, Harvard Business Review, HKEx, HKMA

# [1.1] EM Algorithm for Estimation of Missing Entries and Trends

## The Stochastic Expectation-Maximization (EM) Algorithm

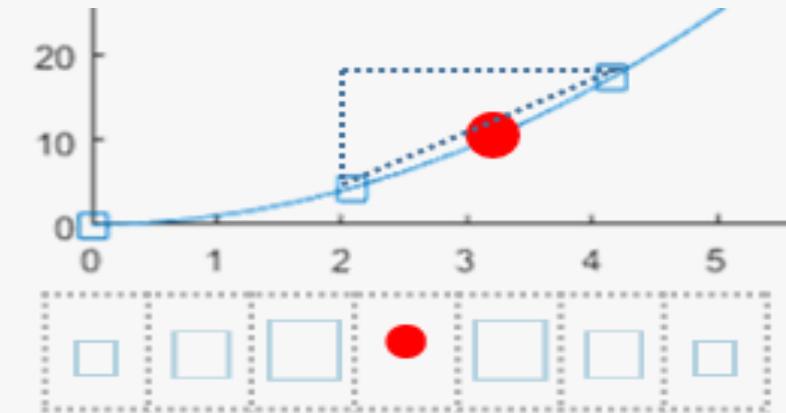
Expectation-Maximization (EM) algorithm is a general, iterative algorithm for parameter estimation by maximum likelihood when random variables involved in a time series are not served (i.e. missing stock prices in certain time stamps). Missing data points can be estimated through multiple layers of simulations, the trendline of a certain stock can therefore be generalized.

### Simplified Data Log-Likelihood (Rubin 1976):

$$F(\theta | Y_{\text{observation}}) = f_1(\theta | Y) - \log [f_2(Y_{\text{missing}} | Y_{\text{observation}}; \theta)]$$

Elite bank recognizes the quotes provided by exchanges should be the most reliable data. However, the deployment of EM algorithmic machine learning system can be utilized as preliminary parameters for alert trigger, in accordance with the mean squared errors of deviant data points.

## Simulation and Asymptotic Results



Suppose the red dot indicates a missing data point, whereas the blue squares are subsets of the time series plot. The value of red dot is computed by simulating the expected value through observing the whole dataset.



Generalization of  
Missing Entries



Real-Time Trendline  
Smoothing

# [Prototype Demonstration 1.1]: EM Algorithm



D9	A	B	C	D	E	F	G	H	I
1	0005.HK - HSBC Holdings PLC								
2	Date	Last Price	Real Value of the Missing Quotes	Piecewise 5-Stamp Moving Average	Percentage Error				
3	07/14/2017 16:09	75.15		75.06	N/A				
4	07/14/2017 15:59	75.1		75.05	N/A				
5	07/14/2017 15:58	75.05		75.0375	N/A				
6	07/14/2017 15:57	75.05		75.0375	N/A				
7	07/14/2017 15:56	75.05		75.0375	N/A				
8	07/14/2017 15:55	75.05		75.025	N/A				
9	07/14/2017 15:54		75	75.17316842	0.002308912				
10	07/14/2017 15:53	75		75.03	N/A	100			
11	07/14/2017 15:52	75.05		75.03	N/A	99			

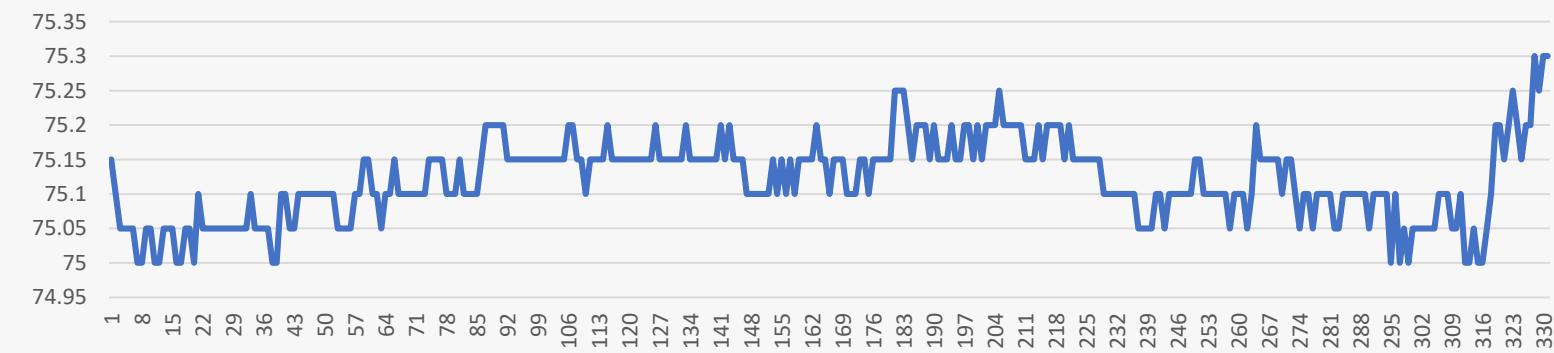
**Remark:** The Maximum Likelihood Simulation was satisfactory in simulating 0005.HK Quote at 15:54 on 14th July 2017. The estimated value is approximated to 75.173 while the percentage error is less than 0.0025, indicating that the data set fits well in the user-defined partition.

(14/7/2017) 0005.HK - HSBC Holdings PLC: Minute Quote

=Missing Value

= Estimated Value Using Maximum Likelihood Simulation

= Real Minute Quote from Bloomberg



Source: G. Andrew Karolyi. (2015). Cracking the Emerging Markets Enigma.

# [1.2] System Linkage with Exchange

## Exchange Linkage as the Second Line of Defense

In case the emergency alert is triggered due to the inconsistency of market data from Bloomberg and Reuters, data from the exchange determines the closing price of the securities. For securities traded on the exchange, data from the exchange must be reliable.

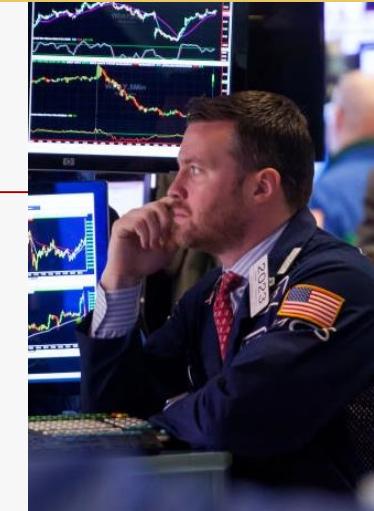


## New York Times Industrial News



### Monday's Plunge in the Yuan Freaked Out China Watchers

In December 2016, professional traders using Bloomberg terminals observed the yuan spot prices from a dozen banks all hovering around the actual price of 6.86/\$1. Then there was ICAP's ask price at 7.48 to \$1. Reasons for capturing erroneous yuan exchange rate were still unclear.



## Essential Stock information Available at Exchange Houses

### HKEx Subscription Fee

(\$ in HKD)

Entry Level Package (Morning & market close)	500
One Cross Connect	1500
Daily Market Reports –Futures & Options	600
Monthly Recurrent Fee (\$)	2600

### Hong Kong Stocks



### U.S. Stocks



### Comprehensiveness

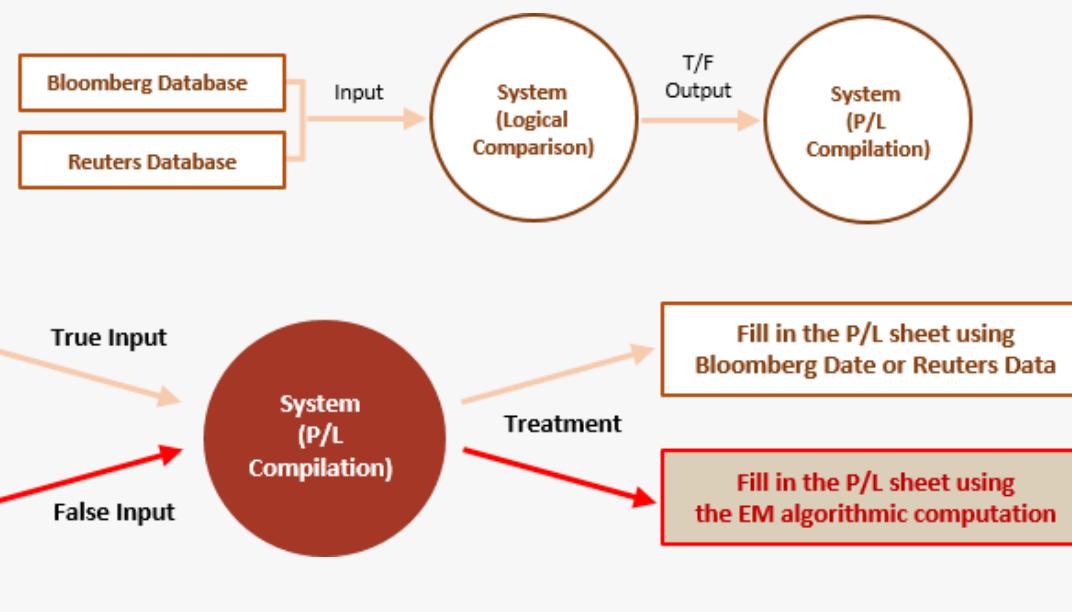
Essential stock information, such as high, low, closing price and turnover are fully disclosed

### Accuracy

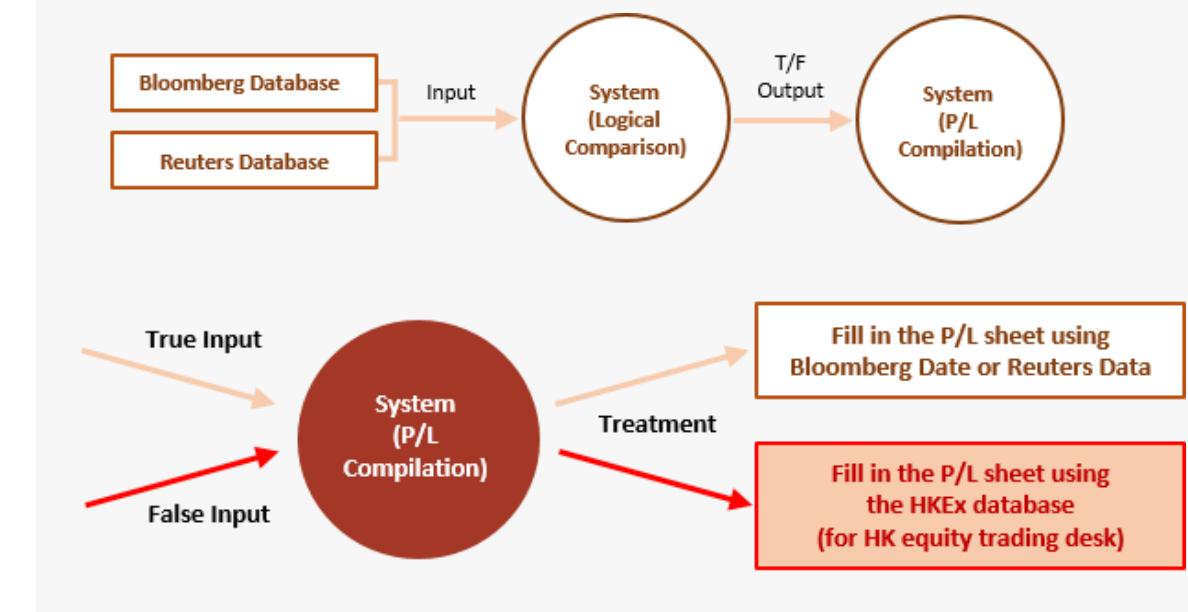
Stock and Option Data is directly obtainable from where these derivatives are traded

Source: HKEx. (2017). HKEx Market Data Services: Real-time Securities Market Data, Bank of America Merrill Lynch

## [1.1] Real Time Data Feeding – EM Algorithm



## [1.2] Market Closing – Exchange Linkage



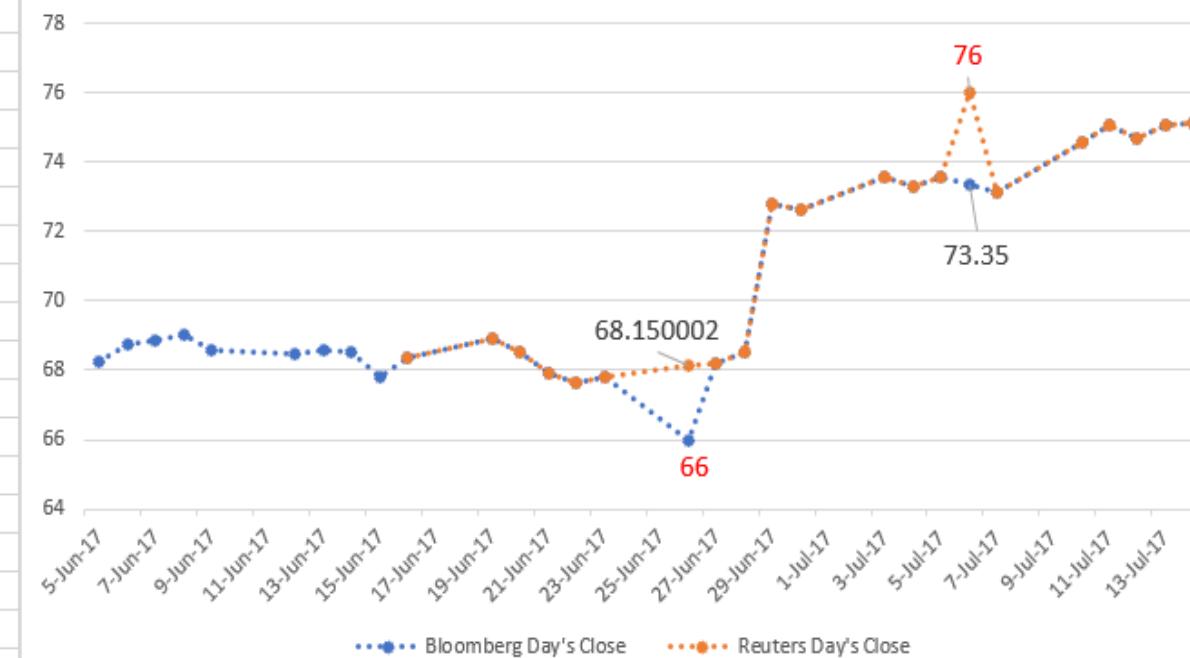
Source: U.S. Securities and Exchange Commission. (2014). Deutsche Bank Securities Complaints.

# [Prototype Demonstration 1.2]: System Linkage with Exchange



8	HSBC Holdings PLC (0005.HK)			
9				
10	Date	Bloomberg Day's Close	Reuters Day's Close	Percentage Error
11	14-Jul-17	75.15	75.150002	N/A
12	13-Jul-17	75.1	75.099998	N/A
13	12-Jul-17	74.7	74.699997	N/A
14	11-Jul-17	75.05	75.050003	N/A
15	10-Jul-17	74.6	74.599998	N/A
16	7-Jul-17	73.15	73.150002	N/A
17	6-Jul-17	73.35	76	0.036128153
18	5-Jul-17	73.6	73.599998	N/A
19	4-Jul-17	73.3	73.300003	N/A
20	3-Jul-17	73.55	73.550003	N/A
21	30-Jun-17	72.65	72.650002	N/A
22	29-Jun-17	72.8	72.800003	N/A
23	28-Jun-17	68.5	68.5	N/A
24	27-Jun-17	68.2	68.199997	N/A
25	26-Jun-17	66	68.150002	0.031548084
26	23-Jun-17	67.8	67.800003	N/A
27	22-Jun-17	67.65	67.650002	N/A
28	21-Jun-17	67.9	67.900002	N/A
29	20-Jun-17	68.5	68.5	N/A
30	19-Jun-17	68.9	68.900002	N/A
31	16-Jun-17	68.35	68.349998	N/A
32	15-Jun-17	67.8		N/A
33	14-Jun-17	68.55		N/A
34	13-Jun-17	68.6		N/A

HSBC Holdings PLC (0005.HK) Day Close  
- Reuters (16th June-14th July) & Bloomberg (5 June-14th July)



Incorrect Day's Close from Data Source(s)

Percentage Error Due to Deviation

Elite Bank Quotes

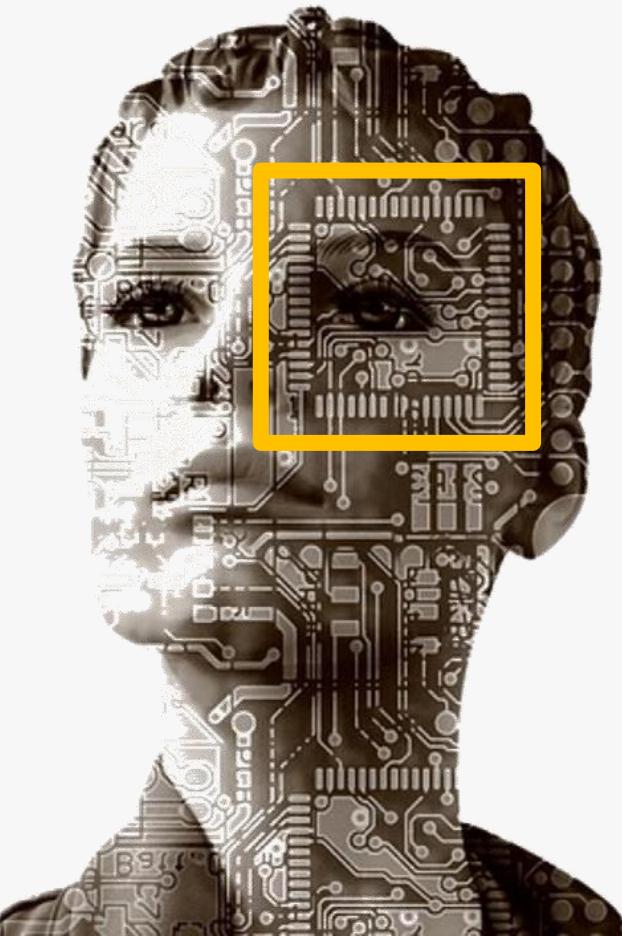
Bloomberg & HKEx (0005.HK)

Reuters & HKEx (0005.HK)



Source: Thomson Reuters. (2016). Accessing Rates via Bloomberg - Thomson Reuters, HKEx, SFC, HKMA, Elite Bank Analysis

### Artificial Intelligence Bot as Elite Bank's Reliable Solution Tank



## Rediscover, Resolve, Refine

With the help of Chatbots or conventional robotic advisors, instant feedback can be generated with preset computerized program designated to simulate an intelligent conversation with one or multiple human users, in natural language via auditory or textual methods.



P&L corrections were unable to be completed due to the lack of workforce in the Data Integrity Team



- a) Generating instant feedback with 90% of relevance and it is available 24/7
- b) Striking up human-like conversations with users through answering inquiries or providing suggestions



In-House Chatbot reduces maintenance manpower expenses and minimizes flow time to mitigate operational risks

Source: BCG Analysis, Deloitte, Accenture, Forbes. (2016). UBS And Amazon Team Up For 'Ask UBS' Chatbot.

# Scenario Analysis: Chatbot for In-House Support



## [1] Learning to Become Familiarized with the Trading System



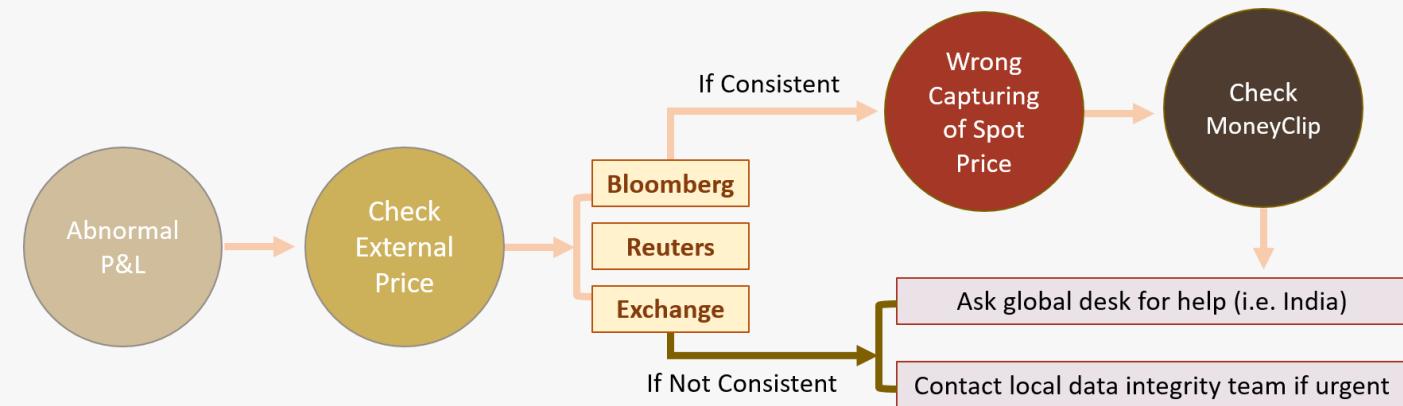
Chatbot can provide information of the trade system description (e.g. functions of MoneyClip) and the linkages between various systems (e.g. MarketBox and StatBox).



## [2] Solving Price Discrepancy Problem

Chatbot can assist a trader to identify the root causes of abnormal P&L and advise him/her with different approaches to mitigate price discrepancy.

**Situation:** [1] Inaccurate External Data Sources  
[2] Wrong Capturing of Spot Price



Source: Deutsche Bank, Goldman Sachs, J.P. Morgan, Elite Bank Analysis

# [Prototype Demonstration 2]: Chatbot for In-House Support



How may I help you?

Hi Chatbot

I find discrepancy in price quoted. Do you know why?

Well, there are two different reasons that may lead to abnormal P&L calculations.

Case one: Unreliable External Data Sources

In this case, you need to double check what is the price quote from external data sources today.

For example, Reuters, Bloomberg, and Exchange.

Case two: Wrong Capturing of Spot Price

If you find that the three external data sources are all the same, then the problem is result from wrong capturing of Moneyclip

Could you please check the situation first and enter caseone or casetwo?

## Case One

### Unreliable External Data Source

It is possible to have reporting errors occurred in Bloomberg or Reuters. Consequently, multisource reference checking is recommended. In addition, when there is price discrepancy between these two sources, double check with the Exchange and take the price quotes from it as the final reference.

## Case Two

### Wrong Capturing of Spot Price

If there is no price discrepancy between the three external data sources (i.e. Reuters, Bloomberg and the Exchange), the occurrence of abnormal P&L generation might be attributed to inappropriate instructions set in MoneyClip.

Source: Amazon Web Services, CurrencyCloud, Oracle, IBM, Elite Bank Analysis

# Global Banking Chatbots Comparable Analysis

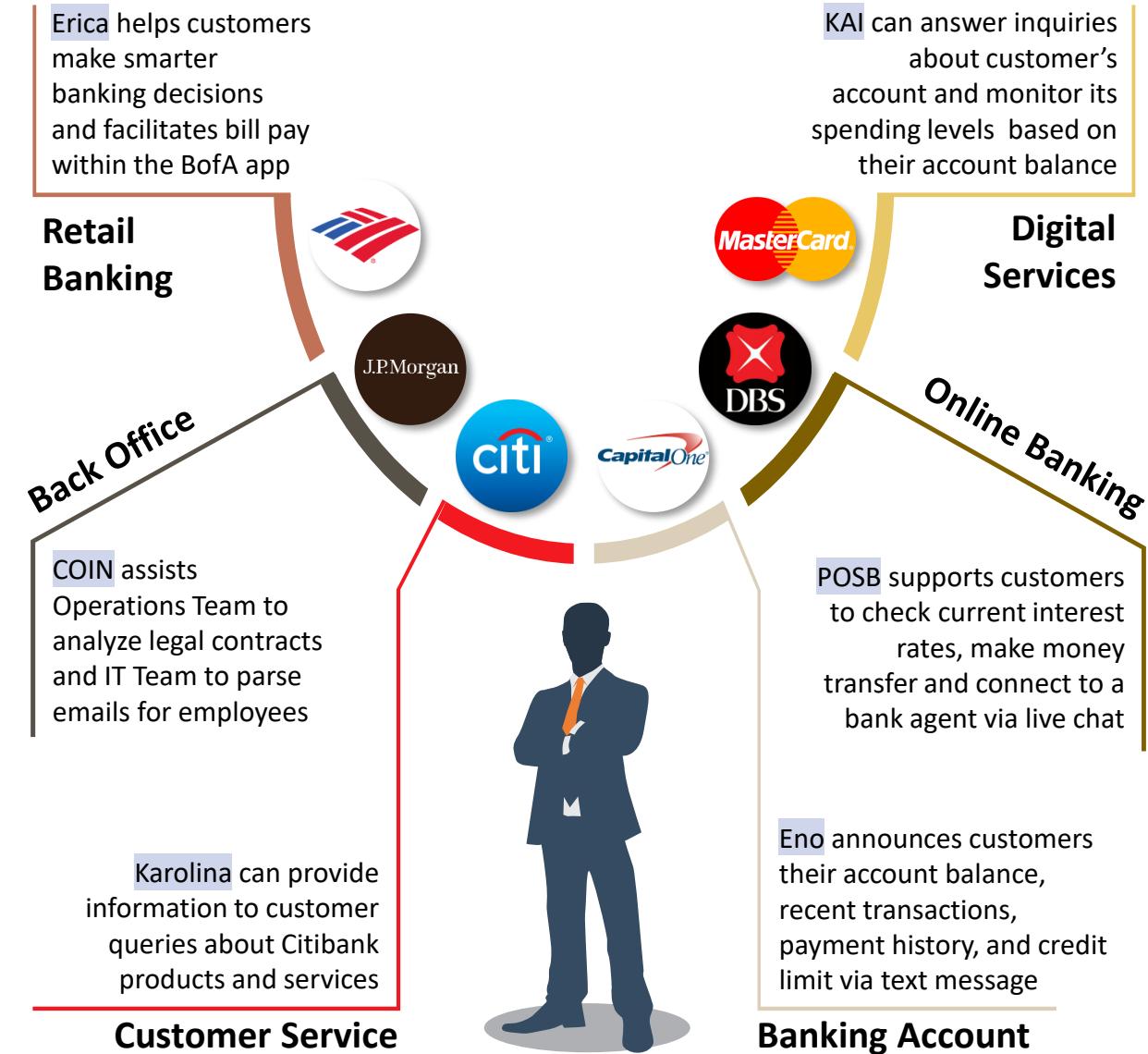


## AI-Powered Chatbots for Better Operational Experiences

The application of Chatbots is a time-saving and cost-efficient process, which eases the burden of system supporters, and preinstalled solution manual can be immediately delivered with 90% of relevance and is available 24/7.



Source: World Economic Forum, CFA Institute, EY (2016) Global banking Outlook



## FinTech Applications in Operations Team



### Clearing & Settlement

Blockchain can help market participants to reduce debt capital requirements and counterparty risk.



### Trade Data Reconciliations

Robotic Process Automation (RPA) can reduce time spent on trade data preparation and reconciliations.



### Transaction Reporting

MiFID Approved Reporting Mechanism (ARM) can help insulate their clients from regulatory change.

## FinTech Investment Benefits



### Longevity

FinTech applications reduce human errors and compensate the lack of manpower



### Traceability

Progressive technological advancement can be utilized as long-term revenue drivers.



Source: Barclays, Deutsche Bank, Deloitte, KPMG, Elite Bank Analysis

# Risk Assessment and Mitigation Planning



We Foresee | We Act | We Overcome

Proposals	Risk Factors	Mitigation
[1.1] EM Algorithm	Overfitting and Validation Errors	- Conditional expectation maximization and non-linear mixture distributions
[1.2] Exchange Linkage	Incorrect Data or Late Delivery	- Contact Exchange Houses for most accurate quotes and report to regulatory authorities
[2] In-House Chatbot	Server Instability and Low User Adaptability	- Constant system risk oversight and frequent user manual updates after processing local team's feedback
[3] FinTech Venture Capital Investment	Fast Changing Market Trends	- In-depth due diligence checking - Unify business vision of Elite Bank and venture capital invested firms



## Quality Service

Handling of technical inquiries, machine learning and algorithmic systems



## Enhancement

Internal relationship management, complaint follow-up and evaluation

Source: Nomura, Citibank, The Institute of Risk Management , Elite Bank Analysis

# Three-Year Implementation Timeline



Intrinsically Motivated. Technically Driven.		2017		2018		2019		2020	
Short Term	Technological	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
		<b>[1.1] EM Algorithm for Stock Price Forecasting</b>							
		Assumptions & Algorithmic Setup							
		Implementation Action planning							
		System Architecture Development							
		Ongoing System Maintenance							
		<b>[1.2] Multi-Source Reference Checking &amp; System Linkage with Exchange</b>							
		Subscription of Bloomberg Terminal & Stock Exchange Data Feed							
		Development of Cross-Checking Alert							
		Ongoing System Maintenance							
Long Term	Operational	<b>[2] Chatbot for In-house Support</b>							
		Data Analytics and Robotics Setup							
		Continuous Feedback Receipt & UI Modification							
		<b>[3] FinTech Venture Capital Investment</b>							
		Business Negotiation and Due Diligence							
		Strategic Partnership Confirmation							

Source: Accenture, McKinsey & Company, Bain & Company, Elite Bank Analysis

## Priming Elite Bank for Success



“Make your vision so clear that your fears become irrelevant.”

## [1.1] EM Algorithm for Stock Price Forecasting

Personnel Costs	Year 1	Year 2	Year 3
Development	15-20 people  (Or consider the development as the first task for the venture capital invested firm)	N/A	N/A
Maintenance	10-15 people	10-15 people	10-15 people
<b>Total Estimated Costs (HKD)</b>	<b>360k</b>	<b>N/A</b>	<b>N/A</b>

**[Note 1]:** The maintenance expense is not a marginal cost item as it is either categorized under the current supportive functions of Elite Bank or the newly implemented venture capital invested firm.

Source: Bloomberg, HKEx, CB Insights, Goldman Sachs, The Economist, Elite Bank Analysis

# In-House Development Cost Breakdown – Technological (2)



## [1.2] Multi-Source Reference Checking & System Linkage with Exchange

Personnel Costs	Year 1	Year 2	Year 3
Subscription Fee (HKEx)	\$2,600 for each subscription per month (\$500 for entry level package, \$1,500 for one cross connect and \$600 for daily reports of Futures & Options)	Same as Year 1	Same as year 1
Subscription Fee (Bloomberg Terminal)	\$15,600 per year	Same as Year 1	Same as Year 1
Development	15-20 people (Or consider the development as the first task for the VC invested firm)	N/A	N/A
Maintenance	10-15 people	10-15 people	10-15 people
<b>Total Estimated Costs (HKD)</b>	<b>218.4k</b>	<b>218.4k</b>	<b>218.4k</b>

**[Note 1]:** The number of subscribers for HKEx and Bloomberg Terminal depends on the staff number in the P&L reporting team. Estimation of the P&L reporting team size is on P. 24.

**[Note 2]:** "Same as Year 1" is on condition that the subscription fee remains unchanged.

**[Note 3]:** Elite Bank (Hong Kong) Analysis is illustrated and similar estimations can be made to cater different markets covered by the trading team of the Elite Bank.

**[Note 4]:** Maintenance expense is not a marginal cost item as it is either categorized under the current supportive functions of Elite Bank or the newly implemented venture capital firm.

Source: Bloomberg, HKEx, CB Insights, Goldman Sachs, The Economist, Elite Bank Analysis

## [2] Chatbot for In-House Support

Personnel Costs	Year 1	Year 2	Year 3
Development	15-20 people (platform development) 15-20 people (outlining business needs)	N/A	N/A
Continuous modification	15-20 people	15-20 people	15-20 people
Collecting feedback	Staff in the Operations team	Same as Year 1	Same as year 1
<b>Total Estimated Costs (HKD)</b>	<b>740k</b>	<b>260k</b>	<b>260k</b>

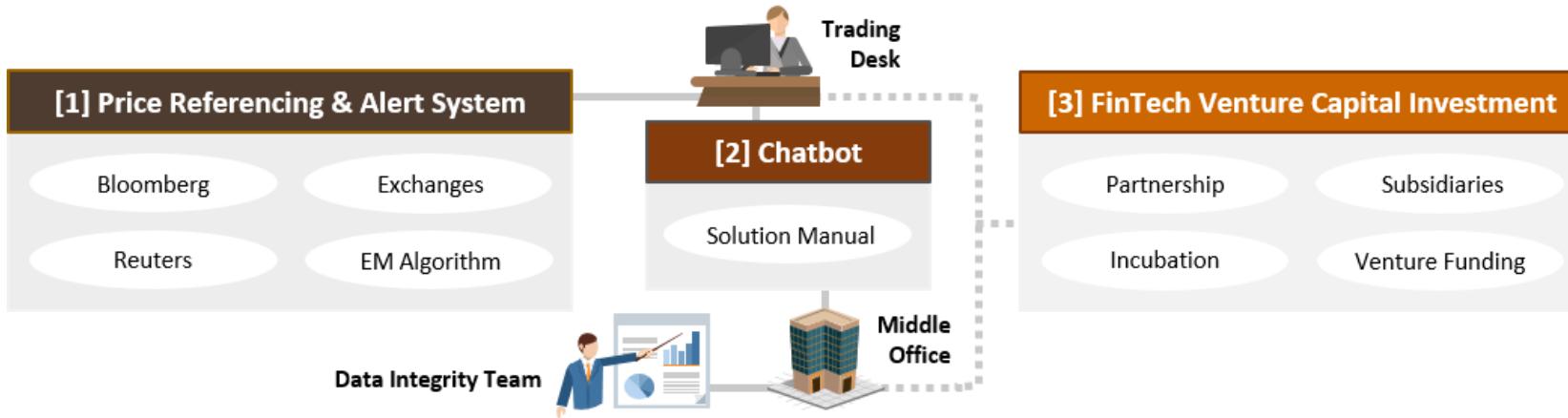
**[Note 1]:** In-House chatbot design starts with understanding how and when chatbot can be applied in Elite Bank's daily routines (for the operations team particularly).

**[Note 2]:** Data sharing platform development can be placed as a project under the venture capital invested firm.

**[Note 3]:** Continuous modification should be conducted by Elite Bank's in-house system architecture team, who engaged in the development phase.

**[Note 4]:** User evaluation is essential in evaluating the efficiency and relevance of chatbot in operational crisis management. Thus, operations team feedback is the key driver for system advancement.

## Intrinsically Motivated, Technically Driven.



Source: Fidelity, BCG Analysis, HSBC, BBVA, World Economic Forum, Elite Bank Analysis

**“Game-changing innovation in investment banking is no longer optional, but imperative.”**

Elite Bank holds the firm belief that smarter solution could be made simple, and the intrinsic motivation to alleviate the bank's operation should be complemented with technological tools. Understanding, regulating and maximizing the benefit of FinTech is set to be a critical means of not only success, but also the survival in the future investment banking landscape.

## Situation Analysis

02 – A Glimpse of Price Discrepancy in Securities Trading

03 – Elite Bank for the Winning Edge: Synergy Overview

## Technological Synergy

04 – Multisource Reference Checking and Alert System

05 – EM Algorithm for Estimation of Missing Entries and Trends

06 – [Prototype Demonstration 1.1]: EM Algorithm

07 – System Linkage with Exchange

08 – Scenario Analysis

09 – [Prototype Demonstration 1.2]: System Linkage with Exchange

## Operational Synergy

10 – Chatbot for In-House Support

11 – Scenario Analysis

12 – [Prototype Demonstration 2]: Chatbot for In-House Support

13 – Global Banking Chatbots Comparable Analysis

14 – FinTech Venture Capital Investment for Long-Term Operational Stability

## Implementation and Benefits

15 – Risk Assessment and Mitigation Planning

16 – Three-Year Implementation Timeline

17 – In-House Development Cost Breakdown – Technological & Operational

20 – Taking Pride in Leading the Elites

## Appendix

22 – [1]: Risk Management System (RMS) in Trading Activities

23 – [1.1]: EM Algorithm for Estimation of Missing Entries and Trends

24 – [1.2]: Number of Subscribers for HKEx Exchange Data

25 – [2]: Benefits of AI-Powered Chatbot in the Banking Industry

26 – [3]: FinTech Venture Capital Investment Trends

27 – [3]: Comparative Analysis of FinTech in Banking Industry

28 – Disclaimer and Forward-Looking Statement

## Definition and Role of RMS

### What is a Risk Management System (RMS)?

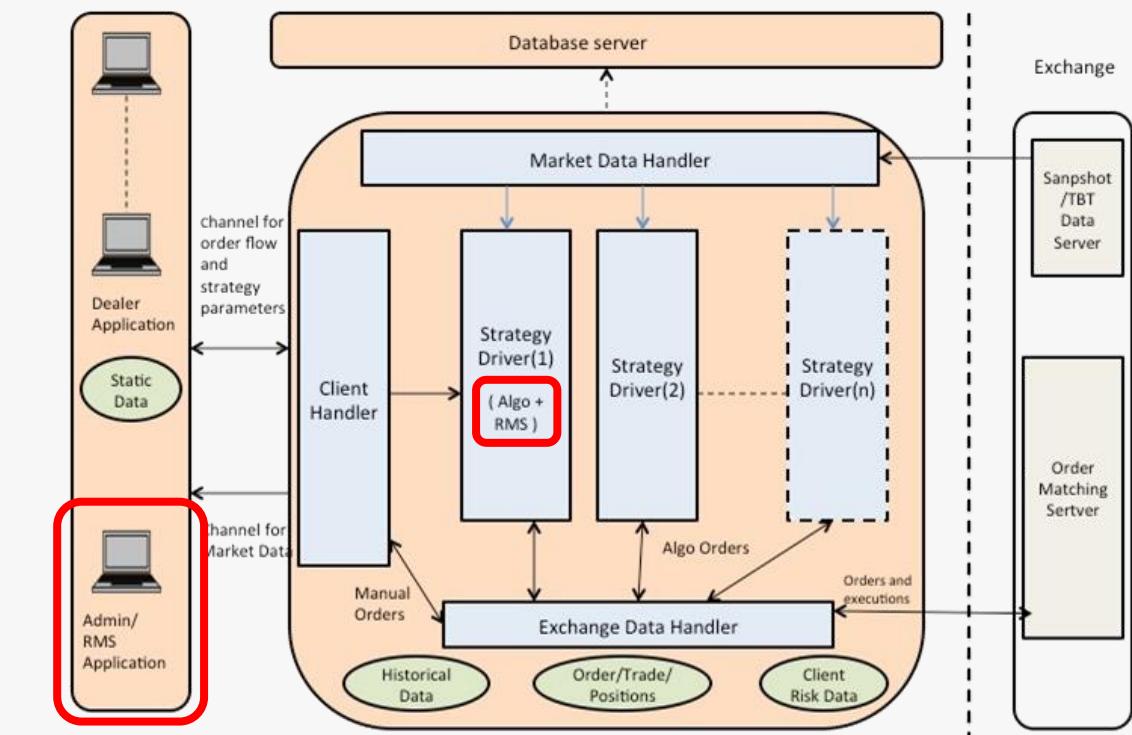
Risk Management System (RMS) comprises a set of guidelines laid down by the Risk Management Team to ensure that none of the trader defaults in payment or to ensure proper funds are available with the trader before and after he/she enters the trade. If a trader is making huge losses, RMS will stop the losses and square off the trades such that trader's account balance will not fall below the prescribed benchmark level. The prescribed limits of leverage a trader can get are obtained through market historical simulation and projection on a daily basis.

### What is the role of RMS in placing an order?

RMS checks whether traders have sufficient balance in their accounts to execute the trade. If the trade is leveraged, then RMS will check only for the margin amount which is the minimum amount after calculation required to open a new trade position.

## RMS in Advanced Order Management System (OMS)

Only the system architecture team within a financial institution is authorized to set up RMS manually, with the aid of algorithms and alert systems to prevent price discrepancy, designated for processing external data sources and capturing spot price



Source: Hu, W. (2005). Calibration of multivariate generalized hyperbolic distributions using the EM algorithm, with applications in risk management, portfolio optimization and portfolio credit risk.

## Estimating Missing Value Using Likelihood Approach

Introducing the expectation–maximization (EM) algorithm:

- a) a very general iterative algorithm for parameter estimation by maximum likelihood when some of the random variables involved are not observed, (i.e., considered missing or incomplete.)
- b) The EM algorithm formalizes an intuitive idea for obtaining parameter estimates when some of the data are missing:

### 1. Replace missing values by estimated values

### 2. Estimate parameters

### 3. Repeat

step 1 using estimated parameter values as true values, and step 2 using estimated values as “observed” values, iterating until convergence.

## SAS Programming Walkthrough

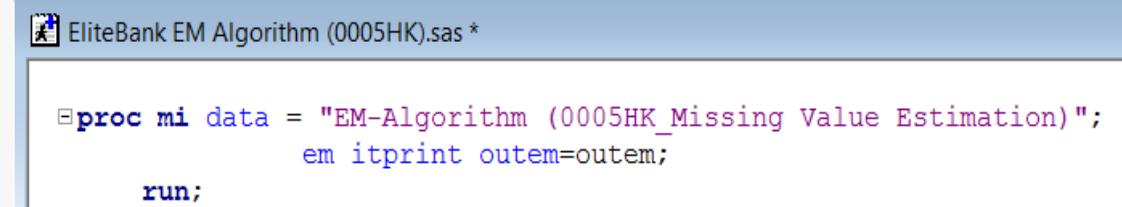
Suppose that a random variable  $Y$  has density function,  $f(Y; \theta)$ , with (unknown) parameter  $\theta$ . If the complete-data variable  $Y$  were observed, it is of interest to compute the maximum likelihood estimate of  $\theta$  based on the distribution of  $Y$ .

- The log-likelihood function (of  $\theta$  given  $Y$ )

$$\log L(\theta|Y) = l(\theta|Y) = \log f(Y|\theta)$$

is then required to be maximized.

- However, in the presence of missing data, only a function of the complete-data variable  $Y$ , is observed.



```
EliteBank EM Algorithm (0005HK).sas *
```

```
proc mi data = "EM-Algorithm (0005HK_Missing Value Estimation)";
    em itprint outem=outem;
run;
```

Source: SAS Institute, R Programming, Xu, L., & Jordan, M. I. (1996). On convergence properties of the EM algorithm for Gaussian mixtures.



Source: HKEx, Thomson Reuters, Bloomberg, Elite Bank Analysis

## Step 1: Identification of Users who Require Access Right to HKEx Database

### P&L Reporting Team

- Producing T+0 and T+1 RMS-based P&L (40-man hour per day)
- Resolve traders' queries and P&L disagreement (15-man hour per day)

## Step 2: Estimation of Total Staff in the P&L Reporting Team

- Working hours from 10 a.m. to 9 p.m. (approximately 10 hours)
- The production of T+0 and T+1 RMS-based P&L is assumed to be conducted continuously during the working hours
- Total staff number is approximated to  $(40/10) / (40/75) = 8$

## Step 3: Confirmation of Subscribers for HKEx Exchange Data

- Prudence concept is adopted when measuring the cost of accessing HKEx exchange data
- Thus, it is estimated there are 8 subscribers specializing in data validation

## Smarter Solutions Made Simple, and More Approachable



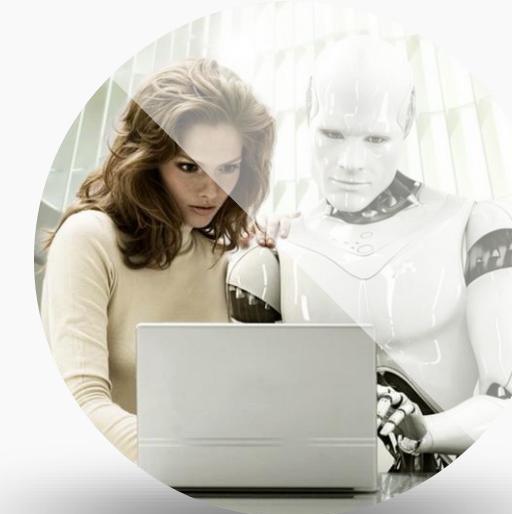
### Relationship Management

Chatbots can complete repetitive and time-consuming tasks without error. Thus, this would free up employer's time for handling complex inquiries which could enhance interactions with customers.



### Time-Cost Efficiency

Chatbots can automate manual back-end tasks and allow operations to run 24/7. Furthermore, it requires less coding and thus developing it is cheaper than a mobile banking application.



### Personalized Banking

Chatbot usage can lead to personalization strategy by alerting customers on the consolidation of outstanding payments, informing them of latest services that are related to their current financial portfolios.

Source: Goldman Sachs. (2017). Fintech Developer as Robo-Advisers in The Works.

# [Appendix 3]: FinTech Venture Capital Investment Trends

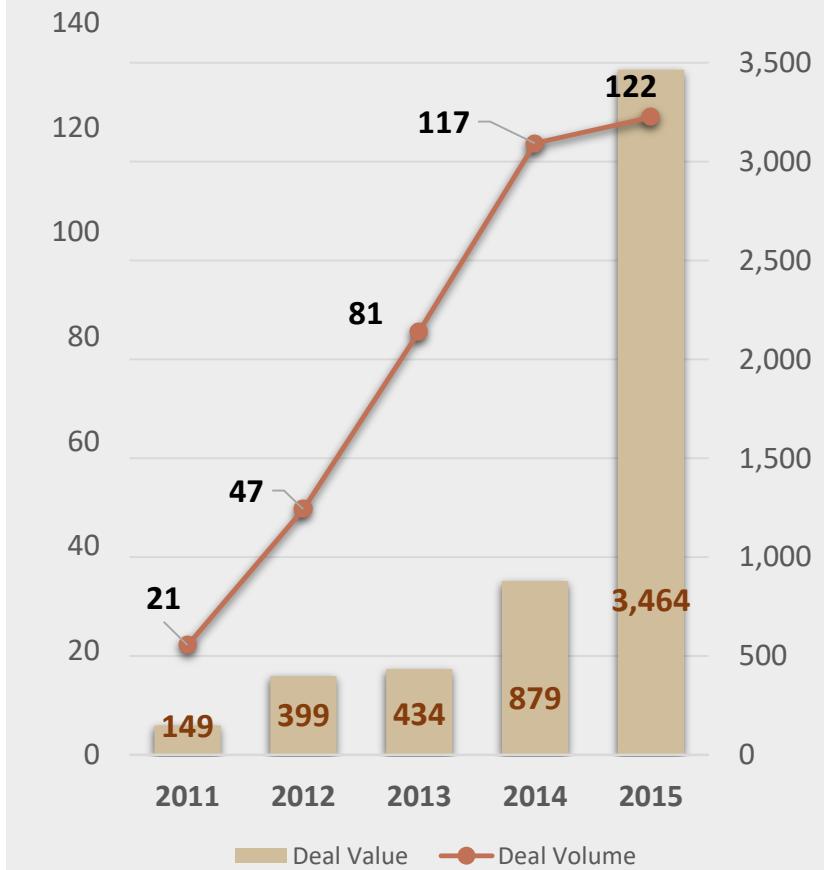


## The Pulse of FinTech: Global Analysis of Investment

Fund	Invested FinTech Company	Amount
AXA Strategic Ventures	One, Inc.	\$20M / Series B (Lead)
AXA Strategic Ventures	Particeep	\$0.92M / Venture
Citi Ventures	Kinetica	\$50M / Series A
Citi Ventures	Trading Ticket	\$2.5M / Seed
Goldman Sachs Principal Strategic Investments	DiffBlue	\$19.63M / Series A (Lead)
Goldman Sachs Principal Strategic Investments	Dyadic Security	\$12M / Series B (Lead)
NAB Ventures	Veem	\$24M / Series B (Lead)
NAB Ventures	Data Republic	\$10.5M / Series A (Lead)

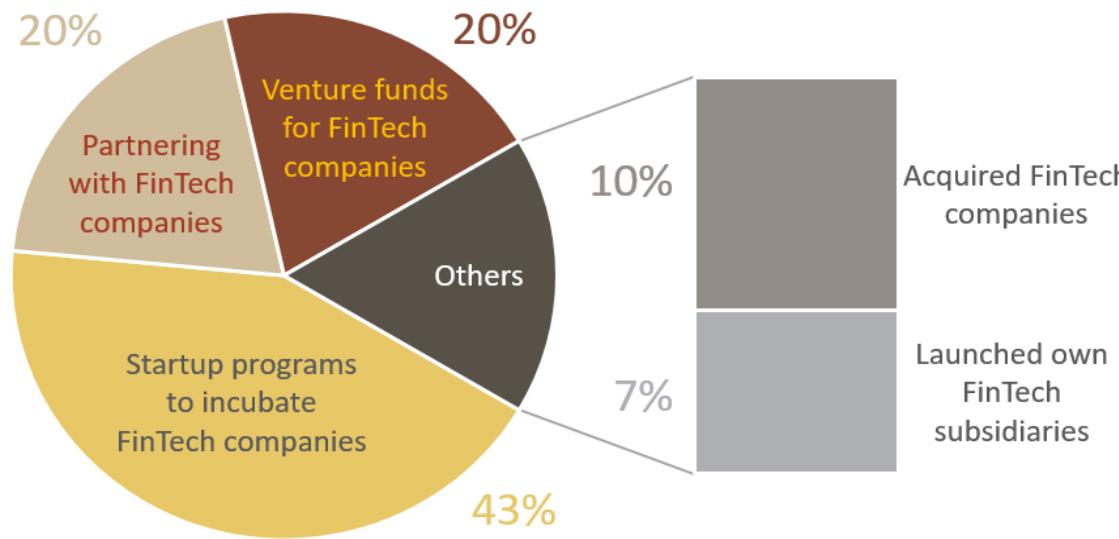
Global financial institutions	FinTech Venture Capital funds	Fund Size (USD mm)	Country of Fund	Year of Origin
Goldman Sachs	Goldman Sachs Strategic Investments	Undisclosed	U.S.	Since 2009
Citigroup	Citi Ventures	Undisclosed	U.S.	Jan 2010
HSBC	HSBC Fund	100	U.K.	May 2014
AXA	AXA Strategic Ventures	220	U.S.	Feb 2015
NAB	NAB Ventures	50	Australia	July 2015

## APAC FinTech Investment Volume and Value (USD Million) Display an Upward Momentum



Source: Fidelity. (2016). Fintech: The next disruptive frontier, EY. (2017). Banking in emerging markets - GCC FinTech play 2017, Elite Bank Analysis

## FinTech Ecosystem Power Plays



The changes and evolution of the financial services landscape that the banking industry has witnessed nowadays are just the beginning of an ever-developing banking eco-system. Technology forces changes in the new financial industry, and it is crucial to deploy innovative and more efficient strategies when combating new disruptions.



Source: Forbes, CurrencyCloud. (2016). Banks and the FinTech Challenge, Elite Bank Analysis

# Disclaimer and Forward-Looking Statement



This is an internal report issued by Elite Bank (Hong Kong) on behalf of Elite Bank; it should not be considered as 'impartial' and is not subject to any prohibition on dealing ahead of its distribution.

Technology and Operations Services may be carried out internationally by different Elite Bank legal entities according to local regulatory requirements. Different companies within Elite Bank (Hong Kong) or the Elite Bank may provide the services listed in this report. Some services are not available in certain locations. This report is provided to you for your information purposes only and should not be relied upon as investment advice. This report is not offering securities, furthermore, this report does not constitute the solicitation of an offer to purchase or subscribe for any investment, instrument or service in any jurisdiction where, or from any person in respect of whom, such a solicitation of an offer is unlawful.

The information contained within this report has not been reviewed in light of your personal circumstances and should not be relied upon in substitution for the exercise of independent judgement. If you have concerns about any investment or are uncertain about the suitability of an investment decision related to Elite Bank, you should contact your relationship manager or seek such financial, legal or tax advice from your professional advisers as appropriate. Market data quoted or shown in this report are sourced from Bloomberg and Reuters unless otherwise stated. While this information has been prepared in good faith including information from sources believed to be reliable, no representation or warranty, expressed or implied, is or will be made and no responsibility or liability is or will be accepted by Elite Bank or any part of the Elite Bank or by any of their respective officers, employees or agents as to or in relation to the accuracy or completeness of the information contained in this report. The information stated, opinions expressed and estimates given constitute Elite Bank's best judgement at the time of publication and do not necessarily reflect the opinions and views of other market participants or other members of the Elite Bank. Elite Bank is under no obligation to keep this information current or update it.

© 2017 Elite Bank All Right Reserved.