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Editor's Foreword

Dear Members,

Welcome to the 2025 issue of HKSS Bulletin.

It is with great pleasure that I present to you this issue of the HKSS Bulletin. I would like to thank Dr. Edmond CHAN who served as the Publication Secretary in the past two years.

There are four articles covered in this issue. Our former President Prof. WAN and his colleagues Prof. TSO and William HU outline the history and development of the HK Consumer Confidence Index. Miss TAM Hei Wa analysed heavy rainfall events in Hong Kong during a recent 10-year period, about outlier of heavy rainfall. Since the consumption pattern of Hong Kong households had remarkable changes during and after the COVID-19 epidemic, Jasmin LEE, Jason CHAN and Iris LAU share the methodology adopted by C&SD in reviewing the expenditure weights of CPI and introduce the chain-linking in CPI compilation. A summary about our annual event - 2023/24 Statistical Project Competition for Secondary School Students is given by the Organising Committee.

Finally, I would like to express my heartfelt gratitude to the contributors and all members of the editorial board.

With warm regards,

Marjorie CHIU

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President's Forum

Professor CHAN Ngai-hang

With the start of 2025, I would like to wish each and every member of the Hong Kong Statistical Society (HKSS) a healthy and rejoiceful Year of the Snake.



HKSS has been playing a pivotal role in fostering statistical research and related activities since its inception almost half a century ago. For over four and a half decades, HKSS has been providing an important platform for researchers, academics, students, civil servants and industrial partners to advance collaborations, stimulate research, and promote professional statistical practices across different disciplines. Through these activities, all members collectively aim to enhance the proper use of statistics to reveal informative insights that would benefit the society at large.

As an example, a delegate of HKSS, led by the Commissioner of the Census and Statistics Department (C&SD) of HKSAR, attended the Third Guangdong-Hong Kong-Macao Greater Bay Area (GBA) Statistical Forum in September 19-20, 2024. The Forum was a phenomenal success with over several hundred participants from different units across GBA. Several members of HKSS, including Commissioner YU, Professors NH CHAN, J HUANG, CL LIU, LX ZHU were awarded the “Thirty Distinguished Scholars in Statistics” recognition during the ceremony. The Forum was a ceremonial event and HKSS will continue to work with other regional/international statistical organizations to promote this kind of activities.



President's Forum

Professor CHAN Ngai-hang

The HKSS - John Aitchison Prize in Statistics 2025 is now inviting nominations. It is anticipated that a large number of highly qualified nominations will be received and I would like to thank the panel members of the selection committee in tackling a challenging task.



In the coming months, the Society will continue its efforts to support our members, foster innovation, and apply statistical methodologies to address various issues faced by the Hong Kong society. Please stay tuned for announcements regarding upcoming seminars, networking opportunities, and other initiatives. I would like to extend my sincere appreciation to all our members for your dedicated involvement and unwavering support in fulfilling the Society's important missions.

Decoding Economic Sentiments: A Deep Dive into Hong Kong's Consumer Confidence Index

*Professor Alan WAN, Professor Geoffrey TSO, and William HU,
City University of Hong Kong*

Consumer confidence doesn't just reflect economic health - it drives it. While numerous economies worldwide track consumer sentiment through confidence indices, the Hong Kong Consumer Confidence Index (HKCCI) stands out for its unique insights into one of Asia's most dynamic financial hubs. Through careful statistical analysis, this powerful economic barometer has captured the attention of analysts, policymakers, and media outlets both in Hong Kong and across international markets.

Consumer confidence is not just a measure; it's a predictor and driver of economic vitality. While indices like the U.S. Conference Board Consumer Confidence Index and the University of Michigan Sentiment Index are well-known, this article shines a spotlight on the Hong Kong Consumer Confidence Index (HKCCI). Part of the broader Cross Strait, Hong Kong, and Macau indices, the HKCCI offers vital insights into one of Asia's most dynamic economic landscapes—insights that resonate well beyond its border.

Understanding the Consumer Confidence Index (CCI) provides valuable insights for laypersons in managing their personal finance decisions effectively. It affects household spending, as higher confidence can encourage expenditures on major purchases, while a lower index might prompt increased savings and reduced spending. In terms of employment, the CCI offers clues about job market stability, helping individuals decide when it might be safe to change jobs or seek promotions. Investment decisions also benefit from observing the CCI; higher consumer confidence often correlates with better stock market performance, guiding timely investment in various assets. Additionally, the index can influence decisions on credit use and debt management, encouraging more cautious financial behavior during periods of low confidence. Overall, by monitoring trends in consumer confidence, individuals can align their financial planning and economic activities with the broader economic environment, enhancing their long-term financial security and immediate economic well-being.

Consumer Confidence Indexes (CCIs) around the world provide critical insights into economic sentiments within various nations, influencing consumer behavior, policymaking, and

market dynamics. In the United States, The Conference Board Consumer Confidence Index is a pivotal economic indicator, paralleled by the European Union's aggregated Consumer Confidence Indicator and the UK's GfK Consumer Confidence Index, each reflecting regional economic outlooks. Similarly, Japan's Consumer Confidence Index and Australia's Westpac-Melbourne Institute Consumer Sentiment Index serve as barometers for economic optimism and consumer spending trends in their respective countries. In Canada, the Conference Board's Index and in South Korea, the Bank of Korea's Consumer Sentiment Index, provide localized insights into consumer perspectives on economic conditions. Brazil's Getulio Vargas Foundation Consumer Confidence Index further exemplifies how these measures can impact both domestic and international economic perceptions, demonstrating the universal importance of CCIs as tools for economic assessment and forecasting across the globe.

The HKCCI was developed by the Statistical Consulting Unit within the City University of Hong Kong and was first introduced in 2008. Since its inception, the HKCCI has played a crucial role in monitoring consumer sentiments in Hong Kong, particularly during significant events such as the global financial crisis in 2008, the social unrest in Hong Kong in 2019, the pandemic from 2019 to 2022, and the subsequent post-pandemic recovery period. Hong Kong's distinctive geographical, economic, and financial position as a connecting point between the Western world and China underscores its significance as a vibrant metropolis. Gaining insights into the sentiments and attitudes of local consumers in Hong Kong provides valuable understanding of the city's economy.

Before China's economic modernisation reform in the late 1970s, Hong Kong held a significant economic role as a major trading hub for re-export for China. From the 1980s until its handover in 1997, Hong Kong served as a crucial gateway for foreign investment into China, with numerous multinational corporations establishing regional headquarters or offices to access the Chinese market. Its success can be attributed to factors such as strategic location, well-developed infrastructure, an efficient legal system, low taxes, and business-friendly policies. The city's financial sector prospered, propelling it to become one of the world's leading financial centres.

Following the handover in 1997, Hong Kong became a Special Administrative Region (SAR) of China under the "one country, two systems" principle. This arrangement aimed to preserve Hong Kong's economic and legal systems, allowing it to maintain its global financial and business hub status. Hong Kong continues to be a significant financial centre, housing

headquarters of multinational corporations and facilitating foreign investment into China. It retains its distinct legal system, currency, and free-market policies, granting it a certain degree of economic autonomy within the broader Chinese system.

However, recent years have witnessed changes in the economic landscape. China's rapid economic growth and the development of financial centres such as Shanghai and Shenzhen on the mainland have increased China's direct integration into the global economy. This has led to some redistribution of economic activities, with mainland Chinese cities becoming more attractive for foreign investment, and Chinese companies exploring alternative avenues to access global markets. Despite these changes, Hong Kong's economic role remains substantial. Its financial sector, rule of law, and business-friendly environment continue to contribute to its importance as an international business hub.

Creating a unified consumer confidence index for Greater China: Hong Kong, Macau, Taiwan and Mainland

When the HKCCI was established in 2008, local consumer confidence indices already existed in mainland China and Taiwan. However, the measurement methodologies varied across regions, making meaningful comparisons difficult. In response to the global financial crisis in 2008, five universities from mainland China, Taiwan, Hong Kong, and Macau collaborated in 2009 to establish a unified index system that measures consumer sentiment across these interconnected regions, based on the methodology of the HKCCI. The resulting index system, known as the Cross Strait (i.e., mainland China and Taiwan), Hong Kong and Macau Consumer Confidence Indices, is published quarterly on the same date by the participating universities: Capital University of Economics and Business and Central University of Finance and Economics in mainland China, City University of Hong Kong, Macau University of Science and Technology in Macau, and Fu Jen Catholic University in Taiwan. The HKCCI became part of this larger index system, representing a collaborative effort to gauge consumer confidence across the four regions.

This index system plays a critical role in comprehending the interconnected economies of mainland China, Hong Kong, Macau, and Taiwan within the Greater China region. It offers a comprehensive measurement tool for local consumer confidence across these regions and enables vertical and lateral comparisons among the four economies. The inclusion

of the HKCCI in this index system enhances our understanding of the closely linked neighbouring districts within the Greater China region.

Beyond Price Changes: Distinguishing Consumer Confidence, Household Costs, and Consumer Price Indices

The Consumer Confidence Index (CCI), Household Costs Indices, and Consumer Price Index (CPI) each play distinct roles in economic analysis, reflecting different aspects of the economic landscape from consumer sentiment to practical cost of living adjustments. Technically, these indices are derived from fundamentally different data sources and methodologies, which affect how they are used in economic policy and personal financial planning.

The CCI is a sentiment-based indicator derived from surveys where consumers are asked about their views on current economic conditions and their expectations for the future, including their personal financial situation, job market, and overall economic conditions. This index is prospective, aiming to predict future behaviors like spending, saving, and borrowing based on subjective consumer assessments. The index is often used by businesses to forecast demand for products and services, by policymakers to gauge consumer mood in response to economic policies, and by investors to anticipate market trends. Its predictive nature makes it crucial for anticipatory economic strategies but less useful for assessing current economic conditions compared to CPI and Household Costs Indices.

On the other hand, the CPI and Household Costs Indices are quantitative measures that track actual changes in the cost of living. CPI measures the average change over time in the prices paid by urban consumers for a basket of goods and services, and is widely used as a measure of inflation. This data is collected by sampling prices of items that are representative of what households typically spend their money on. The CPI is critical for adjusting wages, pensions, and tax brackets to keep pace with inflation, making it a central tool for economic policy. Household Costs Indices, while similar in tracking costs, are tailored to reflect how economic changes affect different types of households, such as those based on income levels or family composition. This specificity makes them particularly useful for social policy and targeted economic interventions, as they can highlight disparities in cost burdens among different demographic groups.

In conclusion, while the CCI offers insights into the future economic activities based on consumer perceptions and expectations, the CPI provides a grounded measure of economic reality based on actual price changes, influencing broad economic policies and personal income adjustments. Household Costs Indices add another layer by dissecting the impacts of economic changes on different segments of the population, thereby informing more nuanced social and economic policies. Each of these indices serves a complementary role in providing a comprehensive view of economic conditions from predictive sentiments to real-time cost evaluations and demographic-specific impacts.

Inside the HKCCI: Survey Design and Statistical Framework

The data collection for the Hong Kong Consumer Confidence Index (HKCCI) is meticulously conducted via telephone surveys utilizing a computer-assisted telephone interviewing (CATI) system. Surveys are executed quarterly in the months of March, June, September, and December. Each survey engages approximately 1,000 respondents, all of whom are aged 18 years or older. The survey instrument is designed to evaluate consumer confidence across six critical and equally weighted categories: economic development, employment, price levels of goods and services, living standards, property purchase, and stock investments. This comprehensive questionnaire not only gathers respondents' immediate perceptions but also their expectations for the forthcoming quarter, providing a dual perspective on consumer sentiment.

In addition to these specific inquiries, demographic data such as gender, age, educational attainment, and income levels are also collected to enrich the analysis. Respondents articulate their confidence levels and future outlook using a five-point Likert scale, where 1 signifies a very negative view and 5 indicates a very positive perspective. For instance, questions concerning the economy prompt respondents to evaluate both the current state of Hong Kong's economy and their anticipations for the upcoming three months. The index calculation strategically assigns a weight of 0.4 to current conditions and 0.6 to future expectations, which ensures that the index presents a balanced reflection of both immediate sentiment and prospective confidence.

The table below presents the questionnaire of the HKCCI.

Sub-Indices	Questions
Economic Development	What is your assessment of the current economic sentiment in Hong Kong?
	How do you anticipate the economic sentiment in Hong Kong will evolve over the next three months?
Employment	What is your evaluation of the current employment situation in Hong Kong?
	How do you anticipate the employment situation in Hong Kong will change over the next three months?
Price Levels of Goods and Services	Do you consider the current general price levels in Hong Kong to be affordable?
	How optimistic are you about the affordability of price levels in Hong Kong over the next three months?
Living Standards	How would you assess your current family's well-being in terms of the quality of your living standards?
	How do you anticipate your family's living standards will change over the next three months?
Property Purchase	Do you believe that now is a favourable time to purchase property in Hong Kong?
	Do you believe that three months from now will be a favorable time to purchase property in Hong Kong?
Stock Investments	Do you believe that this is a favourable time for stock investments in Hong Kong?
	Do you believe that three months from now will be a favourable time for stock investments in Hong Kong?

Table 1: Questionnaire for the HKCCI

The HKCCI scales consumer confidence from 0 to 200, where a score below 100 suggests a prevailing lack of confidence, above 100 indicates robust confidence, and exactly 100 represents neutrality. Additionally, sub-indexes for each category offer granular insights into specific areas of consumer concerns or optimism, reflecting the multifaceted nature of economic sentiment. This methodological approach is comparable to that of the U.S. Conference Board Consumer Confidence Index, a well-established economic indicator that has been tracking consumer optimism regarding the U.S. economy on a monthly basis since 1967.

Insights and Trends: Key Observations from the Hong Kong Consumer Confidence Index

The aggregate Index

As previously noted, the aggregate HKCCI is a weighted average of indices across six categories. Figure 1 illustrates the aggregate HKCCI from Q3 2008 to Q2 2024, while Figures 2–6 depict the sub-indices for each of these six categories over the same period.

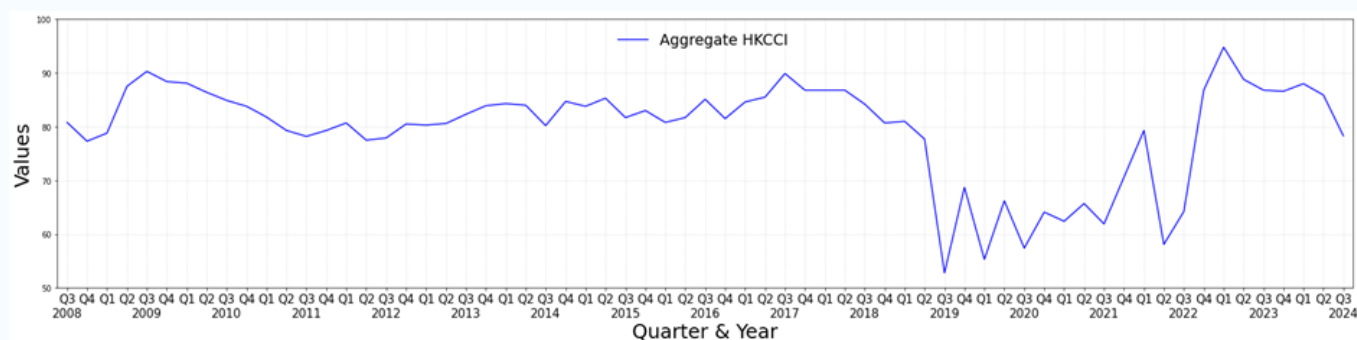


Figure 1: Historical Trend of the Aggregate HKCCI

The historical data presented in Figure 1 indicates that the HKCCI has consistently remained below the neutral mark of 100 between Q3 2008 and Q3 2024, signaling a predominantly pessimistic consumer sentiment in Hong Kong throughout this period. The index averaged 82.7 from 2008 to 2018, which reflects a phase of relative stability despite facing numerous global and local challenges.

The most substantial impact on the HKCCI occurred during the global financial crisis in 2008, when the index plunged to its lowest at 77.3 in Q2 2008, primarily due to Hong Kong's significant role as a global financial hub. Nevertheless, the index experienced a notable recovery to 90.3 by Q4 2009, driven by strong stimulus measures from both local and international governments and the swift recovery of the Chinese economy, which significantly bolstered consumer confidence.

From 2011 to 2016, the HKCCI demonstrated relative stability, although it remained at subdued levels, averaging around the mid-80s. This period was characterized by ongoing global economic uncertainties, including the European sovereign debt crisis and geopolitical tensions, such as the South China Sea disputes. Despite these external pressures, Hong Kong's robust financial sector and trade activities helped maintain a degree of economic stability, keeping consumer confidence within a cautious range.

The index saw an uptick in 2017 and 2018, peaking at 89.9 in Q3 2017. This improvement was largely attributed to the synchronized global economic recovery and strong performances in financial markets. However, the index took a significant downturn in 2019, plummeting to a historic low of 53.2 during the peak of large-scale protests and civil unrest triggered by a controversial extradition bill, which profoundly affected consumer sentiment.

The years 2020 through 2022 were marked by significant fluctuations in the HKCCI, largely due to the COVID-19 pandemic and ongoing U.S.-China trade tensions. The widespread lockdowns and social distancing measures during the pandemic, along with the economic uncertainties from trade disputes, resulted in the index remaining at historically low levels.

In 2023, the index began to show signs of recovery, climbing back to 80 in Q1. This resurgence was supported by the easing of pandemic restrictions, successful vaccination campaigns, and targeted government stimulus measures. Improvements in the stock and property markets during this period also contributed positively to consumer confidence.

Overall, the historical trend of the HKCCI underscores a consumer confidence that, while generally cautious and below the neutral threshold, demonstrates resilience and a capacity for recovery in response to improved economic conditions and effective government interventions.

The Economic Development, Employment and Living Standard Sub-Indices

In general, the sub-indices of Economic Development, Employment, and Living Standard closely parallel the movements observed in the aggregate Hong Kong Consumer Confidence Index (HKCCI). The analyses provided for the overall HKCCI are largely applicable to these sub-indices as well, although it should be noted that the fluctuations within these specific indices are somewhat more pronounced.

The Economic Development sub-index, as shown in Figure 2, initially showed resilience and stability from 2008 to 2018. After hitting a low at 63.7 in Q4 2008 due to the global financial crisis, the index recovered well, averaging around 91.1, and peaked at 106.8 in

Q4 2017. This period of stability reflects strong economic management and favorable global conditions. However, the index experienced a sharp drop to 53.2 in Q3 2019, likely due to local socio-political tensions in Hong Kong and global trade issues, followed by further challenges during the pandemic. A notable recovery began in 2023, where the index rose back above 80, indicating a gradual return of economic confidence among Hong Kong's populace.



Figure 2: Historical Trend of the Economic Development Sub-index

The Employment sub-index, as depicted in Figure 3, similarly exhibited consistent performance from 2008 to 2018, though it reached its nadir in Q4 2008. The index rose significantly during two key periods: Q3 2009 to Q1 2010 and Q1 2016 to Q2 2018, reflecting periods of economic optimism and job market growth. However, it suffered a steep decline in Q3 2019, reaching a historic low of 52.9 in Q3 2020, exacerbated by the pandemic's impact on local and global economies. The subsequent rebound to over 100 by Q4 2022 suggests a strong recovery and possibly a recalibration of the job market in Hong Kong.



Figure 3: Historical Trend of the Employment Sub-index

The Living Standards sub-index is shown in Figure 4, which did not experience a significant drop in Q4 2008, maintained a stable average of around 105 from 2008 to 2018, indicating consistent consumer perceptions of their living conditions. The index faced a significant decline in Q3 2019 but showed resilience with moderate fluctuations during the pandemic, recovering to levels above 100 by Q4 2022 and stabilizing in 2023. This suggests that while immediate economic and employment conditions can fluctuate sharply, the perceived living standards among Hong Kong residents adjust more gradually.

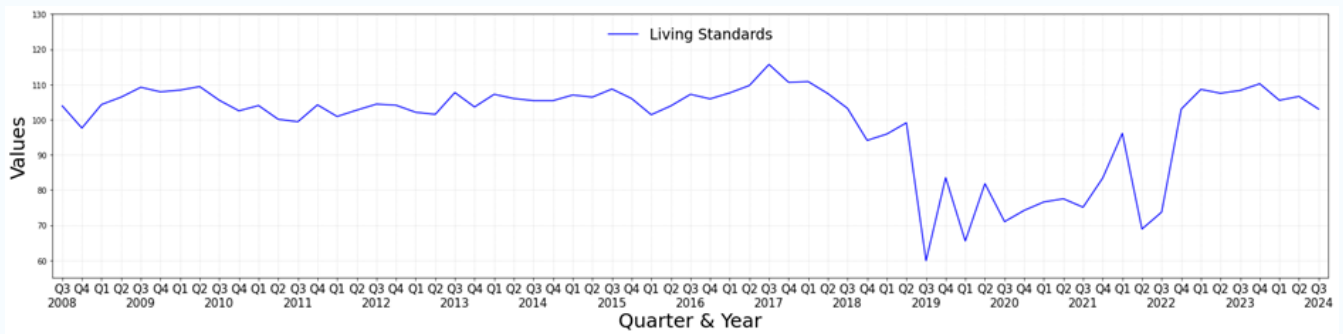


Figure 4: Historical Trend of the Living Standards Sub-index

The three sub-indices reveal a pattern of initial resilience followed by vulnerability to socio-political event in Hong Kong and global economic stresses, with a notable impact during the late 2010s and early 2020s. The sharp declines in 2019 across all sub-indices reflect a critical period of uncertainty for Hong Kong residents, deeply affected by both internal and external challenges. The subsequent recoveries across these indices by 2023 suggest effective adaptive measures and a slow but steady return of consumer confidence.

These trends indicate the sensitivity of Hong Kong's economic, employment, and living standards to both local disturbances and international economic climates. The data suggests that while Hong Kong is capable of rapid recovery, the underlying concerns related to stability and growth prospects remain pertinent issues for policymakers and residents alike. This analysis underscores the need for strategic planning and robust policy frameworks to safeguard and enhance the economic well-being and confidence of the Hong Kong public.

The Goods and Services Price, Property Purchase and Stock Investment Sub-Indices

Figure 5 shows a sub-index that portrays consumer confidence in purchasing power. Despite the economic downturn during Q4 2008 and Q1 2009, notably marked by lower scores in Economic Development and Employment, the Goods and Services Price sub-index remained relatively high. This suggests that consumers initially maintained confidence in their purchasing power during the onset of the global financial crisis. As the economy recovered and prices began to rise, this sub-index experienced a rapid decline between Q2 2009 and Q3 2010, falling below 60 and staying there until Q2 2014, reflecting increasing concerns about inflation impacting consumer purchasing power. From 2014 to 2016, the index showed an upward trend, exceeding 75, but faced instability again between 2016 and 2019, averaging around 70. The index displayed notable volatility especially during the pandemic, averaging approximately 66 between 2020 and 2023.



Figure 5: Historical Trend of the Goods and Services Prices Sub-index

Figure 6 provide the sub-index that reflects consumer sentiment regarding the real estate market's conditions. It averaged 56.7 from 2008 to 2023, the lowest among all sub-indices, indicating a generally low confidence in property purchases, influenced by Hong Kong's status as having the world's most unaffordable property market. The index showed a consistent downward trajectory from 2008 to 2015 as housing prices surged. There was a modest recovery in 2016, but the sub-index plummeted to record lows in Q4 2017 during the peak of property prices. A noticeable decline in housing prices led to a significant improvement in this sub-index, reaching 84.3 in Q1 2024, suggesting a resurgence in consumer confidence due to more favorable market conditions.



Figure 6: Historical Trend of the Property Purchases Sub-index

The sub-index shown in Figure 7 evaluates the perception of suitability for stock investments. Historically, it has shown regular fluctuations, with each rise typically followed by a fall, from 2008 to 2018. The sub-index experienced a significant decrease, reaching a historic low in Q3 2019, which coincided with large-scale social unrest in Hong Kong and a substantial decline in the Economic Development index. Throughout the pandemic, this sub-index exhibited significant volatility, stabilizing only in 2023, reflecting ongoing sensitivity to both local socio-political events and broader economic conditions.



Figure 7: Historical Trend of the Stock Investment Sub-index

The six sub-indices of the Hong Kong Consumer Confidence Index (HKCCI) offer a detailed and multifaceted view of Hong Kong's economic landscape and consumer sentiment from 2008 to 2024, highlighting the complexities and varying dynamics of the marketplace. These indices collectively illustrate the high sensitivity of consumer confidence to both global economic conditions and local socio-political events, showcasing the interconnectedness and responsiveness of Hong Kong's economy. Specifically, the Goods and Services Price sub-index reflects concerns over inflation and its impact on purchasing power, the Property Purchase sub-index provides insights into the notoriously volatile real estate market, and the Stock Investment sub-index shows the fluctuating confidence in financial markets, influenced by economic forecasts and external events. This variability across the indices underscores the need for targeted policymaking and strategic business planning to address sector-specific dynamics and maintain consumer confidence. Policymakers can leverage these insights to stabilize key sectors such as real estate and finance, while businesses can align their strategies with consumer sentiment and economic conditions to optimize operations and market positioning. Overall, the detailed insights from these sub-indices are crucial for navigating Hong Kong's diverse economic environment and fostering a stable, sustainable economic climate.

Benchmarking Consumer Confidence: Comparing Hong Kong, Mainland China, Taiwan, and Macau

The historical trends in consumer confidence for Mainland China, Taiwan, Hong Kong, and Macau from 2008 to 2024, as depicted in Figure 8, reveal distinct patterns and fluctuations that mirror the economic and socio-political climates of each region. Mainland China has consistently exhibited the highest consumer confidence levels, with a significant increase from a range of 90 to 100 before the third quarter of 2014, to a range between 100 and 110 thereafter,

indicating a robust economic growth and stable consumer sentiment over the period.

Taiwan's consumer confidence, on the other hand, began at a markedly lower level, around 50 in the fourth quarter of 2008, making it the least optimistic region initially. However, Taiwan demonstrated a remarkable recovery, with a significant jump in confidence from below 50 to above 70 in 2010, and continued to climb into the 80-90 range by 2014. By 2019, Taiwan's consumer confidence had ascended above 90, surpassing both Hong Kong and Macau during a period when these regions were experiencing declines, showcasing Taiwan's resilience and growing economic stability.

In contrast, Hong Kong and Macau showed similar trajectories but with distinct nuances. Both regions began with indices below 80, but while Macau's confidence levels stabilized within the 80-90 range from 2009 to 2019, Hong Kong's indices were more volatile, experiencing a significant dip to 52.8 in the third quarter of 2019 amidst intense social unrest. This period underscored the sensitivity of Hong Kong's consumer confidence to local socio-political events.

The impacts of the pandemic are also evident in the data, with both Taiwan and Mainland China displaying resilience initially, followed by a decline around the third quarter of 2022. Macau and Hong Kong, however, faced more pronounced fluctuations due to outbreaks, with Hong Kong's confidence plummeting in 2019 and Macau in 2020. Both regions began to show signs of recovery by late 2022, with Macau even reaching a neutral confidence level of 100 in 2023, though it experienced a slight decline early in 2024.

Overall, Figure 8 not only illustrates these dynamic shifts in consumer confidence but also highlights the varying impacts of global and local challenges on consumer sentiment across these four regions. The visual representation and the trends outlined provide crucial insights into the diverse economic landscapes and can aid stakeholders in making informed decisions based on regional consumer confidence levels and their determinants.

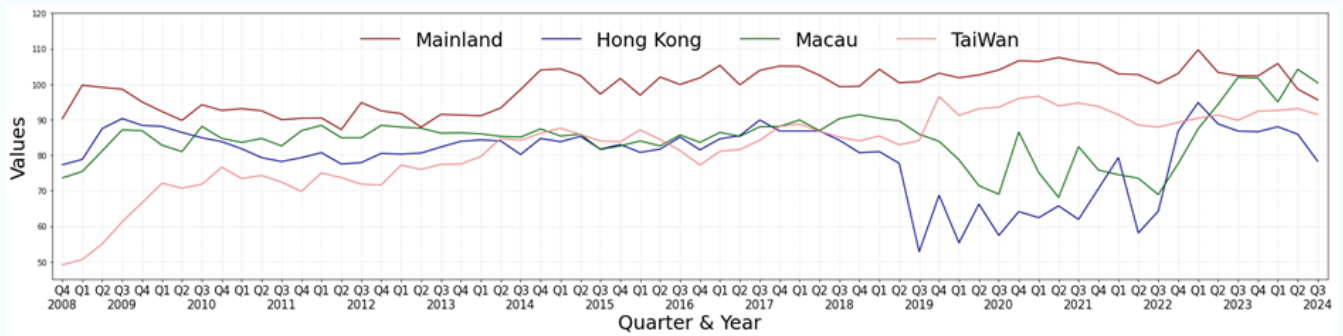


Figure 8: Historical Trend of Consumer Confidence Indices for mainland China, Hong Kong, Taiwan and Macau

Societal Impact

The Hong Kong Consumer Confidence Index (HKCCI) significantly impacts local society and public behavior, as evidenced by its extensive coverage in both local and international media. A key aspect identified is the influence of HKCCI on consumer spending patterns, notably driving Hong Kong consumers to seek more affordable shopping options in nearby southern Chinese cities such as Shenzhen, as highlighted by the Straits Times. This shift, spurred by the lure of lower prices, is reshaping consumer behavior and affecting domestic consumer confidence levels.

Media outlets like the South China Morning Postⁱ and the Standardⁱⁱ have also referenced HKCCI to discuss broader economic trends. For example, a notable increase in the HKCCI in the third quarter of 2023 indicated a robust recovery in spending to nearly pre-COVID levels, suggesting a steady improvement in Hong Kong's economy. However, challenges remain, as evidenced by a TV documentary aired by TVBⁱⁱⁱ, which discussed the pressing issue of high rental costs. This documentary illustrated how rental expenses significantly impact business operations and consumer prices, thereby influencing consumer confidence and economic stability.

ⁱ 8 October 2023. Willa Wu. "Steady Improvement in Hong Kong's Economy Since Start of Year, Finance Chief Says, with Spending Surging to 90% of Pre-Covid Levels." South China Morning Post. Retrieved from <https://www.scmp.com/news/hong-kong/hong-kong-economy/article/3237211/steady-improvement-hong-kongs-economy-start-year-finance-chief-says-spending-surging-90-pre-covid>

ⁱⁱ 9 July 2024. Melody Chen. "Hong Kong Business Confidence Stable but Consumers Downcast." The Standard. Retrieved from <https://www.thestandard.com.hk/section-news/section/2/264217/Hong-Kong-business-confidence-stable-but-consumers-downcast>

ⁱⁱⁱ 18 February 2024. "Economy Under High Rental Cost." YouTube Video [duration in 10:10]. Posted by TVB NEWS Official. Retrieved from https://www.youtube.com/watch?v=Gz_8X79F0s8&t=338s

Overall, HKCCI serves as a crucial barometer for assessing economic conditions and consumer sentiment in Hong Kong. The insights it provides help stakeholders understand the economic landscape, facilitating necessary adjustments to ensure sustainable business operations and consumer satisfaction, as emphasized across various media platforms and discussions.

The HKCCI has garnered significant attention from both local and international media outlets. A recent instance of this was highlighted in an article featured in the Straits Times on 11 April 2024, a prominent English newspaper in Singapore. The article, titled "Hong Kong Consumers' Pessimism about the Economy Leads to Increased Spending Beyond the City", prominently referenced the Goods and Services sub-index to support its assertion regarding the prevailing trend among Hong Kong consumers to spend more in destinations like Shenzhen and other southern Chinese cities. The lure of lower prices in these locations has contributed to a shift in consumer behaviour, subsequently impacting domestic consumer confidence levels.

Analysis of Heavy Rainfall Events in Hong Kong: A Study on the Outliers in a 10-year Period

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1. Introduction

Hong Kong is facing the challenges posed by heavy rainfall events, which have significant implications for the region's socio-economic and environmental systems. The vulnerability to intense rainfall leads to heightened risks of flooding and landslides. The high population density and extensive urban infrastructure further amplify the potential impacts on society, including disruptions to transportation systems, damages to buildings, and threats to public safety. Understanding the outliers of heavy rainfall events over a 10-year period in Hong Kong is crucial for effective urban planning, risk management, and resilience-building efforts.

The purpose of this research is to study the outliers in heavy rainfall events in Hong Kong over a 10-year period from October 31, 2013 to October 31, 2023. The findings will contribute to quantifying the magnitude of outlier events.

2. Dataset and Data Pre-processing

2.1 Dataset

The dataset titled “Daily Total Rainfall All Year - Hong Kong Observatory” from Hong Kong Observatory recorded the daily total rainfall (mm) at the Hong Kong Observatory and was updated monthly. It covered the daily total rainfall during the period from March 1, 1884 to October 31, 2023, consisting 48462 records. Features of the dataset are described below.

Features	Description
年/Year	The year of the recorded date.
月/Month	The month of the recorded date.
日/Day	The day of the recorded date.
數值/Value	The value of total rainfall in mm with 1 decimal place. *** denotes the data is unavailable. Trace denotes rainfall less than 0.05mm.
數據完整性/data Completeness	The indicator of completeness of the data. C denotes the data is non-missing.

Table 1 Features of daily total rainfall dataset

2.2 Data Pre-processing

2.2.1 Reduce Noisy Data

Records with missing value of daily total rainfall are removed from the dataset and those with daily total rainfall denoted as “Trace” are replaced by 0.0 mm. Also, records with missing value in the column “data Completeness” are removed from the dataset. Only the records in the recent 10 years (i.e. from October 31, 2013 to October 31, 2023) are extracted for analysis. There are 3653 records in total.

2.2.2 Preliminarily Analyzing the Data and Visualizing the Data

A subset is created after rearranging the “數值/Value” in descending order. The top 10 records of highest daily rainfall (mm) are shown below:

	年/Year	月/Month	日/Day	數值/Value	數據完整性/data Completeness
1	2023	9	8	425.0	C
2	2023	10	9	369.7	C
3	2021	10	8	329.7	C
4	2017	5	24	273.6	C
5	2016	10	19	223.4	C
6	2017	6	13	219.4	C
7	2023	9	7	215.7	C
8	2015	7	22	191.3	C
9	2017	7	17	184.6	C
10	2020	6	6	183.8	C

Figure 1 Top 10 records of the subset

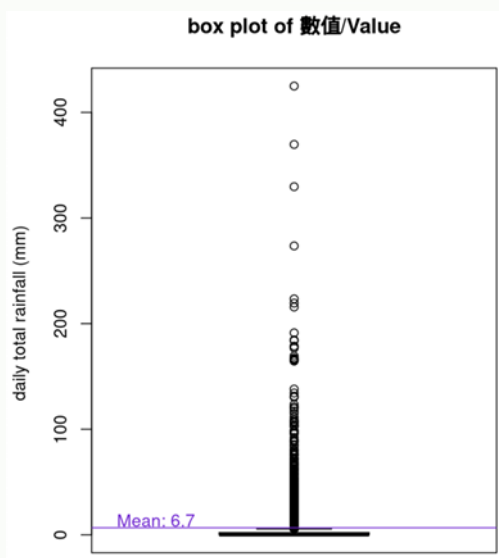


Figure 2 Box plot of 數值/value

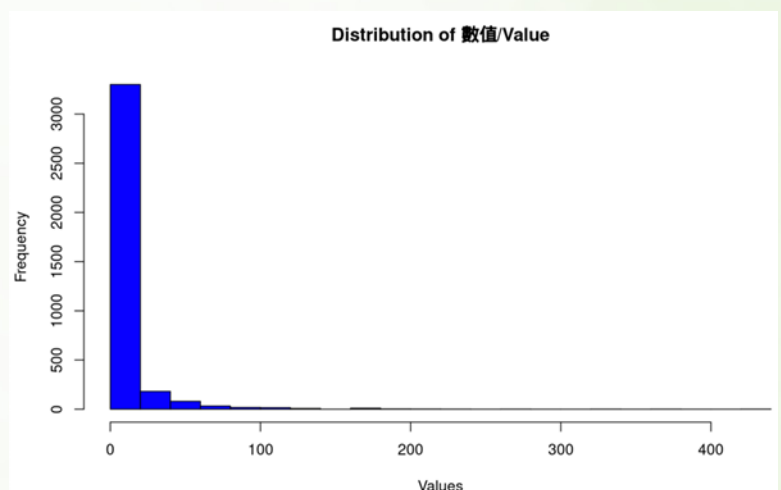


Figure 3 Histogram of 數值/value

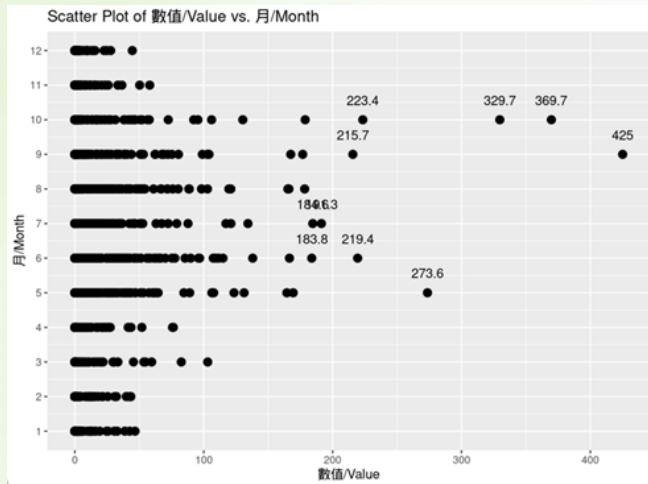


Figure 4 Scatter plot of 數值/value vs. 月/month

```
# A tibble: 687 × 5
`年/Year` `月/Month` `日/Day` `數值/Value`
  <int>      <int>      <int>      <dbl>
1    2013         11         4        12.2
2    2013         11        10         7.6
3    2013         11        12        33.4
4    2013         11        24        15.2
5    2013         12        14         13
6    2013         12        15        22.7
7    2013         12        16        24.8
8    2013         12        17        27.8
9    2014          2         9        13.1
10   2014          2        13        21.4
# i 677 more rows
# i 1 more variable: `數據完整性/data Completeness` <chr>
```

Figure 5 Outliers identified

From the above figures, the data was skewed to the right and there are many outliers. There are 687 out of 3653 records which are identified as outliers. The maximum record in a 10-year period was 425mm on September 8, 2023, which was over 63 times of the mean (6.7mm). The top 10 daily total rainfall record were over 183mm and they were also very far from the mean.

3. Further Analyzing the Outliers

3.1 Outlier Detection (Isolation Forest)

Isolation Forest is an algorithm that helps detect unusual or outlier data points in a table-like dataset without any predefined labels. It does this by randomly dividing the data into smaller groups based on different features or columns. (Cortes, 2023)

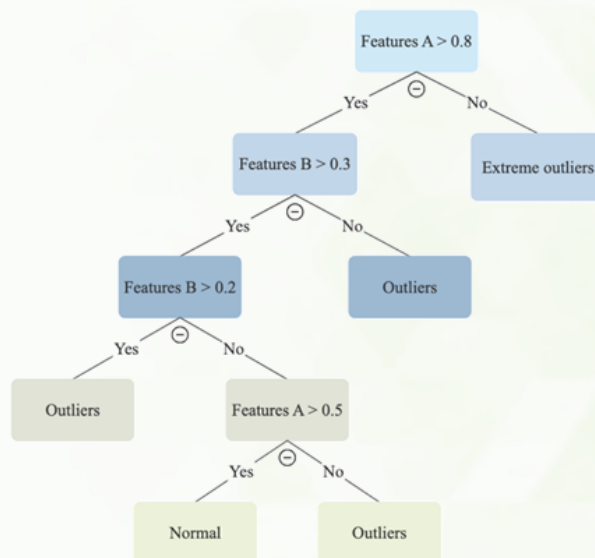


Figure 6 The idea of isolation forest

Algorithm 2 : $iTree(X')$

Inputs: X' - input data
Output: an $iTree$

```

1: if  $X'$  cannot be divided then
2:   return  $exNode\{Size \leftarrow |X'|\}$ 
3: else
4:   let  $Q$  be a list of attributes in  $X'$ 
5:   randomly select an attribute  $q \in Q$ 
6:   randomly select a split point  $p$  between the  $max$  and  $min$  values of attribute  $q$  in  $X'$ 
7:    $X_l \leftarrow filter(X', q < p)$ 
8:    $X_r \leftarrow filter(X', q \geq p)$ 
9:   return  $inNode\{Left \leftarrow iTree(X_l),$ 
10:            $Right \leftarrow iTree(X_r),$ 
11:            $SplitAtt \leftarrow q,$ 
12:            $SplitValue \leftarrow p\}$ 
13: end if

```

Figure 7 Algorithm of isolation forest (Source: Liu, F. T., Ting, K. M., & Zhou, Z.-H. , 2008)

3.2 Isolation Forest using R

Firstly, an isolation forest model is trained using the data subset and the “isolation.forest()” function from the “isotree” package. Outlier scores for the data are then generated using the trained isolation forest model. The “predict()” function is used to make predictions using the “model” object. In this case, “type = “score”” is specified to obtain the outlier scores rather than the actual outlier labels.

A threshold of 0.5 is used when interpreting the outlier scores as probabilities or likelihoods. Any data point with a score greater than or equal to 0.5 is considered as an outlier. This threshold provides a balanced approach, where approximately half of the data points are classified as outliers and the rest as normal.

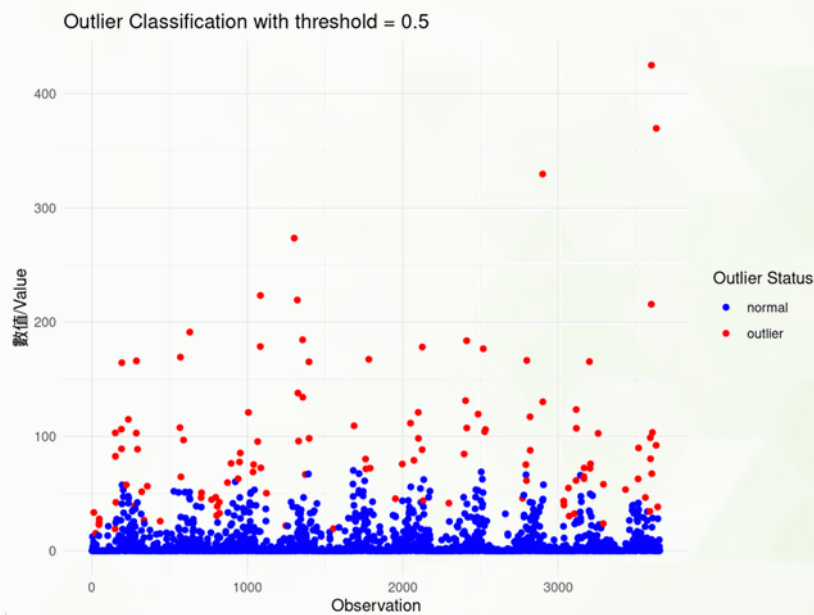


Figure 8 Dot graph of outlier classification with threshold 0.5

Using a higher threshold, such as 0.7, increases the strictness of the outlier classification. Only data points with higher outlier scores will be labelled as outliers, resulting in fewer data points being classified as such. Therefore more extreme or severe outliers can be identified that deviate significantly from the majority of the data.

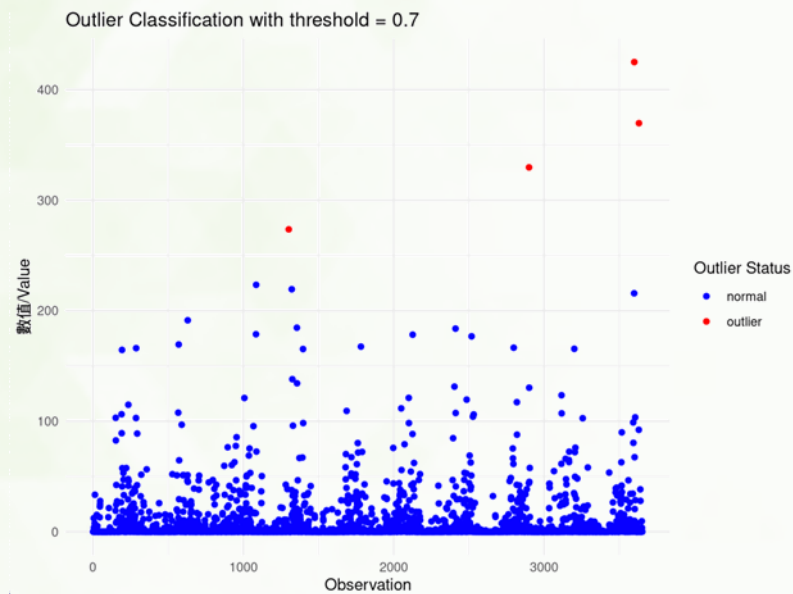


Figure 9 Dot graph of outlier classification with threshold 0.7

When increasing the threshold value, fewer data points will be classified as outliers because only those with higher outlier scores will surpass the threshold. Conversely, decreasing the threshold will label more data points as outliers because a lower outlier score will be sufficient to exceed the threshold. Generating graphs with different thresholds can help in interpreting the severity of outliers by providing the outlier classification. By comparing the graphs generated with different thresholds, the number and the severity of outliers can be observed. This analysis can provide insights into the relative importance of different outlier categories and help guide decision-making or further investigation.

By adjusting the threshold, the extreme outliers are identified. Using a high threshold, there are 4 particular extreme outliers with daily total rainfall value being 425.0mm, 369.7mm, 329.7mm and 273.6mm respectively. Also, those moderate outliers are detected. Lowering the threshold allows for the identification of moderate outliers that may not be extreme but still exhibit significant deviations from the majority of the data. These outliers can provide insights into patterns that may not be observed when focusing only on extreme outliers. By exploring multiple thresholds, there will be a better understanding of the range of outlier values and distribution of the data.

3.3 Return Period Estimation of Heavy Rainfall on September 8, 2023

The estimation of rainfall return periods was conducted using extreme value analysis on historical rainfall data provided by the Hong Kong Observatory (HKO, 2023). The analysis involved fitting a generalized extreme value (GEV) distribution to the recent 100 years of daily total rainfall data by using the package “climextRemes” in R. The return period are set to 0, 50, 100 and 200 years and the rainfall thresholds are limited by 500mm.

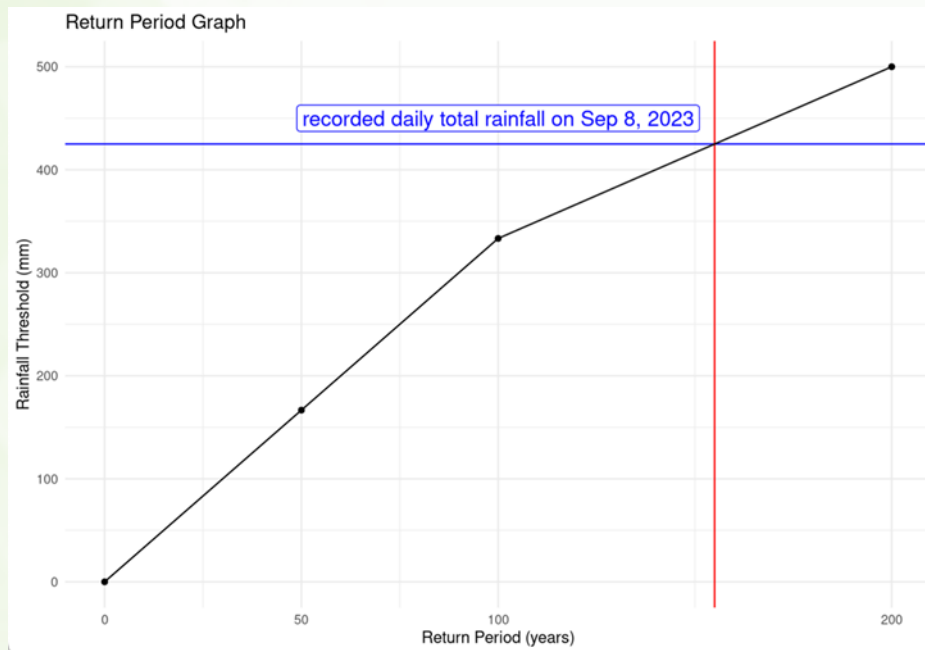


Figure 10 Estimated extreme rainfall return period analysis

The graph visualizes the relationship between return periods (years) and rainfall thresholds (mm). The recorded daily total rainfall of 425mm at the Hong Kong Observatory on September 8, 2023, represented by the blue line, suggests that this event corresponds to a rainfall occurrence with a return period close to 1-in-155 years. Therefore, the record on this day is really extreme compared to the recent 100 years data.

4. Interpretations of the Findings

From the above results, there are 4 extreme outliers which is shown below:

	年/Year	月/Month	日/Day	数值/Value	數據完整性/data Completeness
1	2023	9	8	425.0	C
2	2023	10	9	369.7	C
3	2021	10	8	329.7	C
4	2017	5	24	273.6	C

Figure 11 The 4 extreme outliers

These extreme outliers deviate significantly from the majority of other measurements in the dataset. Especially when the two outliers on October 9, 2023 and October 8, 2021, with precipitation amounts of 369.7mm and 329.7mm respectively, indicate notable rainfall events during the month of October. These extreme values imply heavy rainfall during those specific dates, potentially associated with weather systems or atmospheric conditions prevalent during that time. The daily total rainfall on September 8, 2023 was an extreme outlier by fitting the exponential distribution. The return period of this event close to 1-in-100 years.

The three most significant outliers occurred within the past three years, specifically in 2021 and 2023. The intensity of heavy rainfall has been increasing, highlighting the need

to address the potential consequences and disturbances caused by heavy rain during the rainy seasons of these years. It is important to prioritize measures to mitigate and manage the damage or disruptions that can arise after heavy rainfall.

5. Limitation

5.1 Regional Variations

Different areas in Hong Kong experiencing varying weather patterns and rainfall levels. By analyzing the daily total rainfall at the Hong Kong Observatory, there is a limitation in capturing the full extent of rainfall extremes across the entire territory. Certain areas might receive higher or lower amounts of rainfall, leading to localized variations in extreme weather events. To obtain a comprehensive understanding of the impact of heavy rain, it would be beneficial to consider data from multiple observation points throughout Hong Kong.

5.2 Absence of Clear Definition for Heavy Rainfall Based on Daily Totals

The current analysis focusing on daily total rainfall lacks specific definitions for heavy rain. However, rainstorm warning system are only based on hourly rainfall, which means it does not have any definition for heavy rain based on daily totals. Heavy rainfall events are not solely determined by the total accumulated rainfall within a day. Other factors, such as rainfall intensity, duration, and local topography, can contribute to the severity of the event. Consequently, heavy rain can occur even with relatively low daily total rainfall. It is essential to consider these factors when assessing the impact of heavy rain on the daily lives of people in Hong Kong.

5.3 Overlooking the Impact of Rainfall

Heavy rain, regardless of the daily total rainfall, can significantly disrupt the daily lives of people in Hong Kong. Flooding is a common consequence of heavy rain, leading to transportation disruptions, property damage, and potential risks to public safety. Even if the daily total rainfall does not appear substantial, localized flooding can still occur due to factors like inadequate drainage systems or high urbanization. Therefore, it is crucial to consider the broader implications of heavy rain on the infrastructure, public services, and the well-being of the population when evaluating the impact of rainfall events.

6. Conclusion

In conclusion, the analysis of the daily total rainfall dataset from the Hong Kong Observatory has provided valuable insights into the occurrence and impact of heavy rainfall in Hong Kong. Isolation Forest, an outlier detection algorithm, was employed to identify and

classify outliers in the dataset. By adjusting the threshold, extreme outliers as well as moderate outliers were identified, providing a comprehensive understanding of the range of outlier values and their distribution. These outliers, particularly those occurring in recent years, signify the increasing intensity of heavy rainfall in Hong Kong.

Furthermore, the estimation of the return period for the heavy rainfall event on September 8, 2023, indicated a recurrence interval close to 1-in-100 years. This underscores the significance of addressing the potential consequences and disruptions caused by heavy rain, emphasizing the need for effective measures to mitigate and manage the impacts of extreme rainfall events.

However, the analysis has certain limitations. The focus solely on daily total rainfall at the Hong Kong Observatory overlooks regional variations in rainfall patterns across different areas of Hong Kong. Additionally, the absence of a clear definition for heavy rainfall based on daily totals poses a challenge in accurately assessing the severity of heavy rain events. The broader implications of heavy rain, such as flooding and infrastructure disruptions, also need to be considered beyond solely analyzing daily total rainfall.

In light of these findings and limitations, it is crucial to adopt a holistic approach that considers multiple observation points, factors beyond daily totals, and the overall impact of heavy rain on infrastructure and the well-being of the population. This will facilitate a more comprehensive understanding of heavy rainfall events and enable effective measures to mitigate their consequences in Hong Kong.

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Reviews on the Expenditure Weights of the Consumer Price Index (CPI) and Implementation of Chain-linking in CPI Compilation

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I. Introduction

The Consumer Price Index (CPI) is an important indicator which measures the changes over time in the price level of consumer commodities and services generally purchased by households. Its year-on-year rate of change is widely used as an indicator of the inflation experienced by consumers. To compile the CPI, two types of information are essential: (1) expenditure weights which reflect the expenditure shares of individual commodities and services purchased by households, and (2) data on price movements of commodities and services.

2. Traditionally, the CPI expenditure weights were updated every five years, mainly based on the results of the HES, supplemented by data from other sources (such as those for adjustment on the effect of Government's one-off relief measures). The last major update was made in May 2021, using the expenditure weights obtained in the 2019/20 HES conducted from October 2019 to September 2020.

3. The consumption pattern of the Hong Kong households during the 2019/20 HES survey period was affected by the COVID-19 epidemic. Nonetheless, C&SD had used the 2019/20 HES results to update the CPI expenditure weights, considering that the weights were largely reflecting the actual situation then and there was a need to follow international standard of updating the weights at least every five years. To facilitate timely review and mitigate such episodic effects on CPI compilation, C&SD also embarked to develop an enhanced framework to review the CPI expenditure weights annually and to incorporate the updated expenditure weights in CPI

compilation should there be noticeable changes.

II. Review Framework of the CPI Expenditure Weights

4. The enhanced framework involves annual reviews based on up-to-date data from a diverse range of sources (such as retail sales, restaurant receipts, public transport passenger journeys, Hong Kong residents departures) to update expenditure weights by tracking changes in expenditures. In the absence of detailed HES data, C&SD conducts these reviews at the level of CPI groups¹ or combined groups. The review method makes full reference to and aligns with the latest international guidelines and practices of other economies, such as Australia, the United Kingdom and Canada, which similarly review and update the CPI expenditure weights annually between HES rounds.

5. So far, three rounds of annual review on the CPI expenditure weights have been conducted. The reviews for the first two rounds for the reference years of 2021 and 2022 did not trigger off any updating as no major changes in the expenditure weights had been identified then. The third round of the review for the reference year of 2023 showed more observable changes in the expenditure weights when compared to 2019/20, particularly for certain commodity / service components upon the resumption to normalcy after the COVID-19 epidemic (such as a rebound in “inbound and outbound transport” and “package tours”). As a result, C&SD has updated the reference period of the CPI expenditure weights to the whole year of 2023 starting from the reference month of April 2024.

III. Comparison of the CPI Expenditure Weights between 2023 and 2019/20

6. As compared with 2019/20, shifts in the CPI expenditure weights were more observable in the sections on food, housing, transport and miscellaneous services in 2023, and the reasons for these shifts are given below, while differences in other

¹ For compilation of CPI, C&SD currently categorises consumer commodities and services hierarchically into 9 sections, 88 groups, 237 sub-groups, and 920 items.

sections were relatively small (see Table 1). Notably, weights for food and housing decreased, while those for transport and miscellaneous services increased, reflecting changes in consumer spending patterns post-epidemic. Nonetheless, the expenditure weight on housing in the Composite CPI remained the largest in 2023, followed by food. They together accounted for 65.0% in 2023, slightly smaller than the corresponding weight of 67.7% in 2019/20.

● Food and Housing:

The expenditure weights on food and housing decreased by 0.9 percentage point and 1.8 percentage points in the Composite CPI respectively. This was not only due to the decreases in weight on basic food and private housing rent respectively, but also the increases in weights on other sections of commodities and services.



● Transport:

The expenditure weight on transport increased by 1.1 percentage points, mainly attributable to the increase in weight on “inbound and outbound transport fares” following the resumption of normalcy, and the increase in weight on “MTR fares”.



● Miscellaneous Services:

The expenditure weight on miscellaneous services increased by 0.6 percentage point, mainly due to the increase in weight on “package tours” due to the resumption of normalcy.

Table 1: Expenditure weights of the CPI for the reference years of 2019/20 and 2023

Commodity / service section	Composite CPI		CPI (A)		CPI(B)		CPI(C)	
	2019/20	2023	2019/20	2023	2019/20	2023	2019/20	2023
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Food	27.41	26.49	32.71	31.58	26.76	26.09	21.89	20.98
<i>Meals out and takeaway food</i>	17.05	17.39	18.87	19.33	17.27	17.71	14.55	14.63
<i>Basic food</i>	10.36	9.10	13.84	12.25	9.49	8.38	7.34	6.35
Housing	40.25	38.48	40.46	39.54	40.77	38.67	39.24	36.94
<i>Private housing rent</i>	35.46	33.58	33.43	32.27	37.22	34.99	35.44	33.18
<i>Public housing rent</i>	1.87	1.97	4.95	5.17	0.55	0.66	-	-
<i>Management fees and other housing charges</i>	2.92	2.93	2.08	2.10	3.00	3.02	3.80	3.76
Electricity, gas and water	2.82	3.07	3.85	4.21	2.57	2.82	1.92	2.07
Alcoholic drinks and tobacco	0.49	0.52	0.76	0.84	0.41	0.44	0.27	0.27
Clothing and footwear	2.42	2.74	1.78	2.00	2.51	2.85	3.08	3.46
Durable goods	4.00	4.30	3.29	3.53	3.94	4.26	4.97	5.29
Miscellaneous goods	3.32	3.38	3.31	3.27	3.48	3.51	3.10	3.32
Transport	6.17	7.28	4.52	5.29	6.38	7.52	7.89	9.31
Miscellaneous services	13.12	13.74	9.32	9.74	13.18	13.84	17.64	18.36
All commodity / service sections	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

7. Expenditure weight is a relative measure. Changes in expenditure weight are

influenced by two factors, viz. the growth of expenditures within a specific commodity / service component and the overall growth rate of expenditures. If the increase in expenditure on a given commodity / service component compared to the previous reference period is smaller than the increase in total expenditure during the same period, the weight of that component will decrease, and vice versa. Therefore, changes in expenditure weights reflect the combined effect of relative expenditure growth within specific components compared to the overall expenditure growth, and the changing importance of different expenditure components.

8. For example, the change in the expenditure weight for food is attributed to the change in food expenditure (i.e. the nominator) relative to the change in total expenditure (i.e. the denominator). Even if the expenditure on food increases, but at the same time the total expenditure is increasing at a faster rate, the weight of food would still decrease.

9. Besides, it should be noted that the expenditure of a commodity / service component may change when there are changes in its price, quantity consumed or both. For instance, if MTR fare increases while patronage remains the same, the total expenditure on transportation by MTR would increase.

IV. Merits and Limitations of the Enhanced Framework

10. The enhanced framework supports C&SD to update the CPI expenditure weights on a more frequent basis, in line with the latest international recommendations and practices. With the use of updated weights, the compiled CPIs should be a better measure of the inflation experienced by consumers. Moreover, this framework also allows timely mitigation of the impacts on CPI compilation arising from other episodic events like the COVID-19 epidemic in future.

11. While data from sources other than HES are considered adequate for updating the CPI weights at broad level of commodities, those for the detailed level of

commodities and for different household expenditure groups (i.e. CPI(A), CPI(B) and CPI (C)) have to rely more on statistical assumptions. Nonetheless, the impact of this limitation on the relevance and usefulness of the CPIs is considered to be minimal.

V. Chain-linking Methodology

12. Upon the incorporation of new expenditure weights, the internationally recommended chain-linking methodology² has also been technically introduced to seamlessly link the index compiled using the new weights to the prevailing CPI series compiled using the old weights. When compared with previous weight updating exercises, the use of chain-linking methodology can ensure that a single CPI series is in place for use by users with the historical index remains intact, instead of compiling in parallel CPI series of different weighting periods.

13. When adopting the chain-linking methodology, it is necessary to clearly define the following three reference periods.

- **Weight Reference Period:** This refers to the period used to derive the expenditure weights. For the annual review of 2023, it is the whole year of 2023.
- **Price Reference Period:** This refers to the period whose prices appear in the denominators of the price relatives used to calculate the index. The price reference period should immediately precede the introduction of the reweighted index, typically designated as period 0. For the annual review of 2023, since April 2024 is the first month for the reweighted CPI, the price reference period is March 2024.
- **Index Reference Period:** This refers to the period for which the index is set to 100. In the context of linking the reweighted series to the current 2019/20-based CPI series, it is the 12-month period from October 2019 to September 2020. By using a consistent index reference period, the CPI series can be linked together seamlessly, ensuring the continuity and comparability of the index series.

² Chain-linking methodology is the process of joining together two sets of fixed-basket index that overlap in one period (i.e. linking month) by rescaling one of them to make its value equal to that of the other in order to create a continuous time series.

14. For better understanding, **Table 2** below shows the comparison of the three reference periods for fixed-weight and chain-linking approaches.

Table 2: Reference periods of fixed-weight and chain-linking approaches

Reference periods	Fixed-weight approach	Chain-linking approach
Weight Reference Period <i>the period used to derive the expenditure weights</i>	Oct 2019 – Sep 2020	Whole year of 2023 (example)
Price Reference Period <i>the period whose prices appear in the denominators of the price relatives used to calculate the index</i>		Mar 2024 (example)
Index Reference Period <i>the period for which the index is set to 100</i>		Oct 2019 – Sep 2020

15. The compilation of the chain-linked CPI involves the following steps. Firstly, price relatives are calculated for individual commodity / service components. This is done by comparing the current price (e.g. April 2024) to the price at the price reference period (i.e. March 2024), resulting in price relatives. These price relatives are then aggregated to derive the price index for individual commodity / service components. The CPI for the current month (e.g. April 2024) is then obtained by aggregating the products of the price index of each component with the respective new weights. Finally, the resulting index is then linked to the 2019/20-based index using a conversion factor based on the overlapping month or the linking month (i.e. March 2024). The formula for deriving the chain-linked CPI for April 2024 is provided below:

$$p_{w=2023}^{Apr24, Oct19-Sep20=100} = \text{Conversion factor} \times p_{w=2023}^{Apr24, Mar24=100}$$

$$\text{Conversion factor} = \frac{p_{w=Oct19-Sep20}^{Mar24, Oct19-Sep20=100}}{100}$$

where:

$$p_{\text{weight reference period}}^{\text{reference month, index reference period}} = \text{the price index of a commodity / service component}$$

16. Because of the introduction of new weights every year, the annual rates of

change in CPI will not only capture changes in prices but also changes in the weight structure. The formula for deriving the year-on-year rate of change of the chain-linked CPI is provided below:

$$\frac{p_j^{y,m} - p_j^{y-1,m}}{p_j^{y-1,m}} \times 100$$

where:

$p_j^{y,m}$ = the price index of commodity / service component j in month m of year y

$p_j^{y-1,m}$ = the price index of commodity / service component j in month m of year $y - 1$

17. The formula³ to compute the contribution of a commodity / service component to the chain-linked overall CPI is provided below:

$$C_j^{y,m} = \left[\left(\frac{p_{TOT}^{y-1,12}}{p_{TOT}^{y-1,m}} \times w_j^{y-1,12} \right) \times \left(\frac{p_j^{y,m} - p_j^{y-1,12}}{p_j^{y-1,12}} \right) \right] + \left[\left(\frac{p_{TOT}^{y-2,12}}{p_{TOT}^{y-1,m}} \times w_j^{y-2,12} \right) \times \left(\frac{p_j^{y-1,12} - p_j^{y-1,m}}{p_j^{y-2,12}} \right) \right]$$

where:

$C_j^{y,m}$ = the contribution of commodity / service component j to the year-on-year change of all commodity / service components in month m of year y

$p_j^{y,m}$ = the price index of commodity / service component j in month m of year y

$p_{TOT}^{y,m}$ = the price index of all commodity / service components in month m of year y

w_j^y = the weight of commodity / service component j in the reference year y

12 = the linking month

18. Chain-linking methodology leads to non-additivity features such that higher-level indices (e.g. CPI all-item, section, group indices) cannot be obtained by simply weighting up the lower-level indices (e.g. CPI item indices) using the new weights. Aggregation to higher levels must be based on the initial indices using the new weights before chain-linking. This is because different linking factors are applied to each index level, such as section, group.

19. Although the chain-linking methodology affects the compilation of CPI to a certain extent, it has been tested and revealed that it does not have any significant impact on the year-on-year rates of change at the all-item CPI.

3 In Hong Kong, March is used as the linking month. To simplify the formula, December (i.e. 12) is used as the linking month in the formula for illustration.

VI. Way Forward

20. As an ongoing enhancement in CPI compilation, C&SD will continue to conduct annual reviews and update the expenditure weights when necessary. It is expected that a more comprehensive updating covering detailed level of commodities and for different CPI series will be made in 2026 with the availability of the 2024/25 HES results. The framework will also be comprehensively reviewed then for a longer term implementation. It is envisaged that there will be a continual need to conduct HES every five years to enable comprehensive updating of CPI weights, unless alternative sources of data for meeting the same purposes are made available to C&SD.

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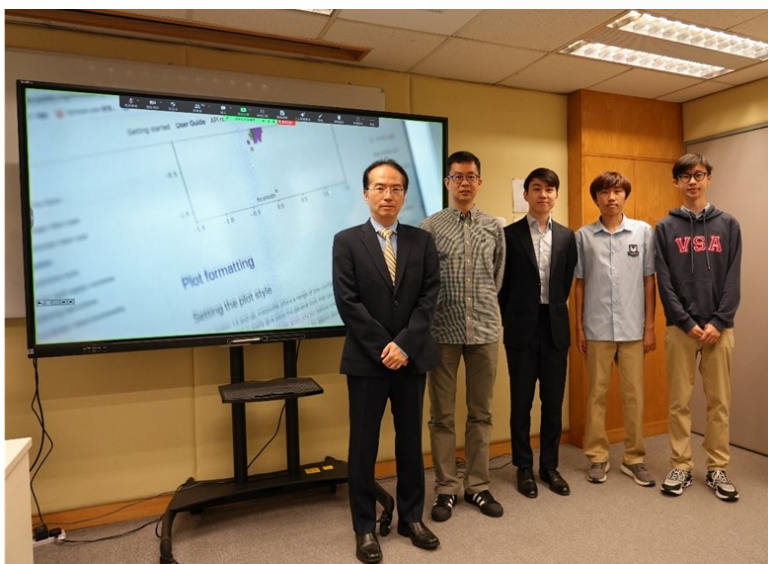
2023/24 Statistical Project Competition for Secondary School Students

Organising Committee* of the 2023/24 Statistical Project Competition

The 2023/24 Statistical Project Competition (SPC) for Secondary School Students, the 38th round of the Competition since 1986/87, was successfully completed. The SPC was jointly organised by the Hong Kong Statistical Society (HKSS) and the Education Bureau. The objective of the SPC is to encourage secondary school students to understand the local community in a scientific and objective manner through the proper use of statistics, thereby promoting their social awareness and sense of civic responsibilities.

The SPC has two Sections for participants, namely Junior Section for Secondary 1 to 3 students and Senior Section for Secondary 4 to 6 students. Junior Section participants are required to submit their projects in the form of a poster with their own choices of themes, while Senior Section participants in the form of a report with their own choices of themes. In addition to the First, Second, Third and Distinguished Prizes, each Section of the Competition also offers the *“Hang Seng Indexes Company Limited Prize for the Best Index Application”* and the *“Department of Management Sciences, the City University of Hong Kong Prize for the Best Graphical Presentation of Statistics”*.

To help interested participants prepare for the Competition, a Briefing Seminar for 2023/24 SPC was held on 21 October 2023. Professor CHEUNG Ka-chun of The University of Hong Kong, Chief Adjudicator, had introduced the rules and regulations of the Competition. Representatives from the Census and Statistics Department (Mr Wilson YUNG Wai-hei) and Hang Seng Indexes Company Limited (Mr Danny CHU Wai-kit), sponsor of 2023/24 SPC, had introduced the use of official statistics and “Hang Seng Index and Statistics” respectively. The winners of the last round of Competition were also invited to share their experiences. In addition, an online exhibition of past winning projects was also carried out from 21 October to 21 November 2023.



Group photo of speakers taken in the Briefing Seminar

Encouraging number of entries

In 2023/24 SPC, 146 entries and 86 entries were submitted for the Junior Section and the Senior Section respectively from 875 students of 76 secondary schools. While the total number of entries was similar to that in previous round, the number of participating schools had reached a record high, reflecting the overwhelming responses and promising support from the academia. Demonstrating the diversity of topics, the entries covered various socio-economic issues of Hong Kong.

Adjudication panel led by Professor CHEUNG Ka-chun

An adjudication panel, led by the Chief Adjudicator, Professor CHEUNG Ka-chun, and comprised some 50 academics from local tertiary institutions as well as statisticians and research managers working in the Government, was set up for the Competition. Panel members scrutinised all the received projects stringently, shortlisted the more outstanding entries, and interviewed students of the shortlisted projects before determining the winning teams of the various awards. The Organising Committee would like to express our special thanks to Dr. Alpha LING Man-ho of The Education University of Hong Kong and Professor CHEUNG Ka-chun for serving as the Chairpersons of the interview panel for Junior and Senior Sections respectively.

Prize Presentation Ceremony

The Prize Presentation Ceremony for the 2023/24 SPC took place on 22 June 2024 at the Auditorium of the Hong Kong Federation of Youth Groups Building. Professor CHAN Ngai-hang, President of HKSS, Mr Leo YU Chun-keung, Commissioner for Census and Statistics, Ms Edith TSE Yuen-ching, Principal Assistant Secretary of Education Bureau, Mr Danny CHU Wai-kit, Head of Index Strategic Research of Hang Seng Indexes Company Limited, Ms Teresa NG Kit-yee, representative of the Department of Management Sciences of City University of Hong Kong and Professor CHEUNG Ka-chun, Chief Adjudicator, were invited to the Ceremony to present prizes and trophies to the winning teams. Council members of HKSS, including Ms Edith CHAN Lai-shan, Dr. Wilson KWAN Chun-kit, Dr. Alpha LING Man-ho and Dr. Marjorie CHIU Lai-lin, also attended the Ceremony to share the joy of the winning teams.



Group photo taken in the Prize Presentation Ceremony

Regarding the results of the Competition, students of Diocesan Girls' School, who used official statistics to study the Skyglow phenomenon in the world and in Hong Kong,

won the First Prize for the Junior Section. Another group of students of Diocesan Girls' School won the Second Prize, while students of Buddhist Sin Tak College won the Third Prize. Students of Pui Ching Middle School won the Prize for the Best Index Application, while students of La Salle College won the Prize for the Best Graphical Presentation of Statistics.

Mr Leo YU presented the First Prize for the Junior Section to students of Diocesan Girls' School



Mr Danny CHU presented the First Prize for the Senior Section to students of King's College



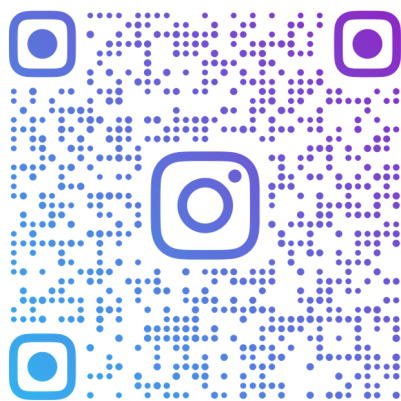
As for the Senior Section, the statistical report from students of King's College was appraised as the best among all the projects. They applied official statistics to study the environmental protection efforts in Hong Kong. Students of St. Paul's Co-educational College won the Second Prize, while students of Stewards Pooi Kei College won the Third Prize and also the Prize for the Best Graphical Presentation of Statistics. Students of Diocesan Girls' School won the Prize for the Best Index Application.



Professor CHAN Ngai-hang, Ms Edith TSE, Ms Teresa NG and Professor CHEUNG Ka-chun presented prizes to winning teams (from left to right and from top to bottom)

Social Media

Social media platforms (including a Facebook page and an Instagram for SPC) have been set up for promoting the SPC since last year. Interested members can scan the QR codes below and follow our social media pages for updated information.



Gratitude

The Organising Committee would like to express sincere gratitude to the patrons of the Competition, Mr Leo YU Chun-keung, Commissioner for Census and Statistics, and Ms Teresa CHAN Mo-ngan, Deputy Secretary for Education, for their support to the event. Special thanks to the Adjudication Panel and helpers who had paid tremendous contribution to their adjudication process and ceremony.

***Organising Committee for the 2023/24 SPC:**

Ms Carly LAI	Census and Statistics Department
Mr CHAN Sau-tang	Education Bureau
Mr Brian CHENG	Census and Statistics Department
Mr Vinci CHEUNG	Census and Statistics Department
Ms Yan IP	Census and Statistics Department
Miss Carmen LO	Census and Statistics Department
Mr Jordan MO	Census and Statistics Department
Mr Ian NG	Census and Statistics Department
Mr Hinz SHUM	Census and Statistics Department
Mr Wilson YUNG	Census and Statistics Department

Social Activity—Hiking to Tai Tam Reservoirs

A hiking to Tai Tam Reservoirs (大潭水塘) was jointly organised by the Society and the Association of Government Statisticians on 16 March 2025. A total of 18 members and their families/friends participated in the activity. They enjoyed the scenery and admired the historic waterworks structures along the trail. Some snapshots are given here to highlight the enjoyable social activity.



News Section

◆ Personnel Changes (New Appointments, Promotions and Retirements)

Department of Statistics of the Chinese University of Hong Kong (CUHK)

- ※ Prof CHAN Kin Wai was promoted to Associate Professor with effect from August 2024.
- ※ Prof LIN Zhixiang was promoted to Associate Professor with effect from August 2024.
- ※ Prof ZHANG Jiacheng joined the department as Assistant Professor with effect from August 2024.

Department of Mathematics and Information Technology (MIT) of the Education University of Hong Kong (EduHK)

- ※ Dr NG Tsz Kit Davy joined the department as Assistant Professor with effect from December 2024.
- ※ Dr WEI Zhengyuan joined the department as Assistant Professor with effect from December 2024.
- ※ Prof SONG Yanjie was promoted to Professor with effect from October 2024.
- ※ Dr WANG Yue joined the department as Associate Professor with effect from August 2024.
- ※ Mr CHUI Hin Leung Mike was promoted to Senior Lecturer II with effect from July 2024.
- ※ Dr FU Hong was promoted to Associate Professor with effect from July 2024.
- ※ Prof WANG Minjuan joined the department as Chair Professor of Emerging Technologies and Future Education with effect from July 2024.
- ※ Dr ZHANG Qiaoping was promoted to Associate Professor with effect from July 2024.

News Section

◆ Personnel Changes (New Appointments, Promotions and Retirements) (Cont')

Department of Mathematics, Statistics and Insurance of the Hang Seng University of Hong Kong (HSUHK)

- ※ Dr FUNG Wing Hong, Derrick was promoted to Associate Professor with effect from September 2024.
- ※ Dr SIU Chi Chung was promoted to Associate Professor with effect from September 2024.



◆ The HKSS - John Aitchison Prize 2025

The HKSS - John Aitchison Prize in Statistics, 2025 is open for application until April 28, 2025. The Prize is open to those members of the Society who have had full-time student status for a PhD degree in Statistics or a closely related discipline at a Hong Kong university anytime within the past two years before the closing date for applications. All submissions received will be reviewed by the Adjudication Panel for the 2025 Award, chaired by Prof. Jian HUANG of the Hong Kong Polytechnic University. The award winner will be informed by email and the winner announcement will be released in around June 2025 tentatively.

For submission and enquiries, please contact the committee for the 2025 Award by email hkss.japrize.submission@gmail.com