香港統計學會
Hong Kong Statistical Society
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Editor's Foreword

First of all, I would like to thank all members of the Editorial Board. This is the first Bulletin of this year and I hope you like it. As usual, I would urge you members to contribute some articles for this Bulletin, or, you may inform us some interesting news in statistics.

In this issue, we have our President's Forum. We have an interesting official statistics article that discusses the concept of the latest international guidelines and the results of implementation in Hong Kong.

Also, Ken Li has a detail discussion on using and teaching with the well known software SAS as SAS users may not be aware that SAS cannot detect semantic errors. Lastly, we would like to remind our readers that we have two statistics conferences in December and we strongly recommend your members to join and participate in our functions.

L.K. Li

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President's Forum

Professor Tony W.K. FUNG

This year the Society is organizing two important events.

The first event is the 2005 Hong Kong Statistical Conference which is to be held on 17 December 2005. It is a good opportunity for Society's members gathering together to present their recent work and learn more about others' research findings. Members please come and participate in the Conference. It is more than 10 years since we have held our last conference. The Conference is kindly sponsored by SAS Institute Limited and Wing Lung Bank Limited. For more details, please visit the conference website

http://www.hku.hk/statistics/HKSS2005

The second important event is the 20th Anniversary of the Statistical Project Competition (SPC) for Secondary School Students. The Organizing Committee, chaired by Mr Frank Fong, has already been formed. I would like to thank the Committee Chairman and Members who have been working very hard to make the event a success.

In this occasion, I would like to express my deep gratitude to Mr Frederick Ho, an Honorary Member of the Hong Kong Statistical Society and former Commissioner for Census and Statistics. The SPC was founded about twenty years ago when Fred was the President of HKSS. He has been continuously supporting the event, acting as the Patron of the SPC for more than 10 years until his recent retirement. I would like to take this good opportunity to say: Thank you very much and happy retirement, Fred.

Development in National Accounts Statistics of Hong Kong: Implementation of Latest International Guidelines on Financial Intermediation Services

Leslie TANG
Census and Statistics Department

Introduction

The Census and Statistics Department recently completed a technical exercise to implement the latest international guidelines on financial intermediation services produced by banks in the compilation of national accounts statistics of Hong Kong. As a result, Gross Domestic Product (GDP) level figures were revised upwards by 2% in recent years.

The latest guidelines enable GDP figures to reflect in a better way the economic contribution of banks in facilitating the channeling of funds from units with surplus funds (e.g. depositors) to units with demand for funds (e.g. borrowers). In particular, financial intermediation services consumed by households (e.g. the services to facilitate withdrawing and transferring money through automatic teller machines, assessing the credit worthiness of personal loans) and non-residents can now be estimated indirectly and included in GDP figures.

Economies including France, Germany and the USA which also have an important financial services sector have implemented the same guidelines. Others like UK and Luxembourg will do so in the coming few months. Implementing the guidelines will generally lead to upward revisions to the GDP of the economies concerned. Hence, it is necessary for Hong Kong to follow suit and implement the same guidelines, so as to ensure that GDP statistics of Hong Kong are comparable to those of economies with an important financial sector. This paper discusses the concept of the latest international guidelines and the results of implementation in Hong Kong.

Latest international guidelines

Financial intermediation services refer to the channeling of funds from units with surplus funds (e.g. depositors) to units with demand for funds (e.g. borrowers). These services are usually provided by banks. In the process, banks provide risk management, liquidity provision and convenience services. For example, to borrowers, banks mobilize funds to provide credit facilities at the convenience of borrowers and bear the default risk. To depositors, banks establish branch offices and automatic teller machines to facilitate deposit, withdrawal and transfer of funds at the convenience of the depositors.

In providing these financial intermediation services, banks do not collect explicit service charges. Instead, they charge ***indirectly*** by lending at higher interest rates and borrowing at lower interest rates. Given the special nature of indirect charges

on the financial intermediation services provided by banks, both banks and their customers (e.g. households) do ***not*** know the market value of the financial intermediation services produced and consumed. Therefore, in GDP compilation, it is necessary to develop a method to (a) estimate the market value of financial intermediation services produced by banks, and (b) the market value of financial intermediation services consumed by various users.

For (a), the market value of financial intermediation services produced by banks is estimated by the net interest receipts of banks and included in the gross output of banks. This method, being adopted since its recommendation in the 1968 System of National Accounts (SNA)[1], poses no problem in national accounts compilation. Indeed, if this method is not applied, the value added of banks in GDP will become unreasonably small, or even negative.

For (b), at the time when the 1968 SNA was made, it was considered very difficult in practice to find a method to estimate the value of financial intermediation services consumed by various economic sectors. As a pragmatic solution, it was recommended to treat the whole value of financial intermediation services as intermediate consumption of all economic sectors **combined**. In other words, it was assumed that financial intermediation services were all consumed by business establishments and that no financial intermediation services were consumed by households and non-residents. In compiling GDP by production approach, an item called "Adjustment for Financial Intermediation Services Indirectly Measured (FISIM)"was deducted from sum of value added of all economic sectors to arrive at GDP.

Apparently, the treatment given in the 1968 SNA is becoming more and more inappropriate. Along with development of globalization and promotion on personal banking services, including personal loans, credit card, the consumption of financial intermediation services by non-residents and households has been increasing rapidly in recent years. Hence, there is a need to develop a new method to estimate the value of financial intermediation services consumed by various users, particularly by households and non-residents.

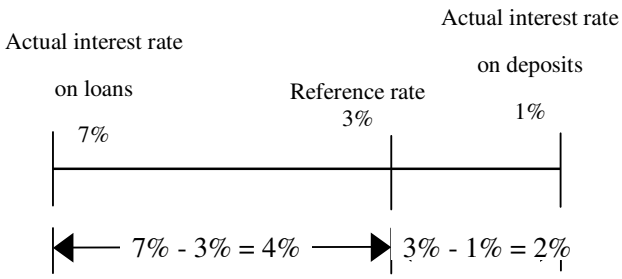
Under the 1993 SNA, the value of financial intermediation services consumed by various users/sectors can be indirectly estimated and included in GDP figures, using the concept of "reference rate of interest". The reference rate of interest is a risk-free interest rate and does not include any financial intermediation services. The interbank rates are suitable proxies of reference rate. This is because the borrowings/lendings among banks involve minimal risks, hence the interbank rates are considered to be free of financial intermediation services and close to the concept of "pure cost of borrowing" given in the 1993 SNA .

The following chart illustrates the concept of "reference rate" in calculating the value of financial intermediation services

[1] The System of National Accounts (SNA) is an authoritative manual for the compilation of national accounts. The latest version is the 1993 version, which is jointly prepared by the Commission of the European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and the World Bank.

provided by banks to depositors and borrowers. To depositors, banks pay interest rate (1%) that is lower than the reference rate of interest (3%). The difference of 2%, which is given by reference rate (3%) *less* actual interest rate on deposits (1%), represents the interest margins that banks earn through providing various financial intermediation services to depositors. Similarly, to borrowers, banks charge interest rate (7%) that is higher than the reference rate of interest (3%). The difference of 4%, which is given by actual interest rates on loans (7%) *less* reference rate (3%), represents the interest margins that banks earn through providing various financial intermediation services to borrowers.

The differences between the actual rates of interest and the reference rate represent the interest margins that banks earn for providing financial intermediation services



Using the concept of reference rate of interest, the values of the financial intermediation services consumed by different types of depositors and borrowers (e.g. households, business establishments, non-residents) can be estimated as follows:

(a) For each type of depositor, the value of financial intermediation services consumed is equal to the stock of deposits multiplied by the average interest margins of that type of depositor;

(b) Similarly, for each type of borrower, the value of financial intermediation services consumed is equal to the stock of loans multiplied by the average interest margins of that type of borrower.

In Hong Kong, the main data used for implementing the reference rate method include (a) banks' stock of deposits and loans, (e.g. loans provided by banks to various economic sectors); (b) effective interest rates on different kinds of deposits and loans (e.g. mortgage loans). Most of these data come from the Hong Kong Monetary Authority and the Balance of Payments statistics system in Hong Kong. Besides, market information (e.g. interest rates on credit card advances) and expert views from the financial sector are also used as parameters in the estimation.

Results of Implementation in Hong Kong

Impact on Gross Domestic Product (GDP) statistics

Stemming from the implementation of the latest guidelines, the entire series of GDP figures were revised upwards. In order to maintain comparability of the data series, backdating of historical series was made for GDP and its affected components. In recent years, the upward revisions to the level of GDP were around 2%. Of this, about 1.5% points were attributable to upward revision to private consumption expenditure. This was comparable to those of France and Germany (1.5% and 1.3% respectively). The

remaining 0.5% point was attributable to the net exports of financial intermediation services consumed by non-residents, which was higher than France and Germany (around 0.1% to 0.2%). This reflected the significance of Hong Kong in facilitating the channeling of funds in the region.

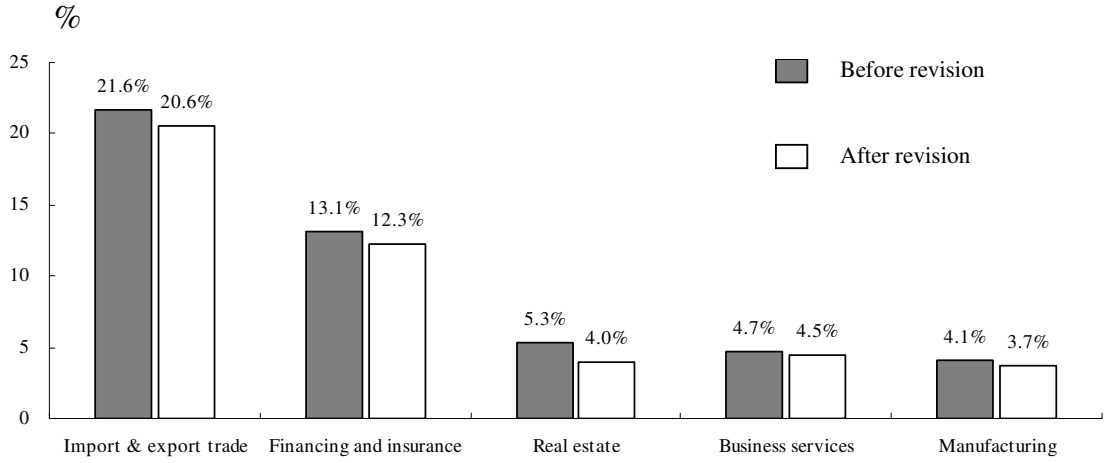
The upward revision to the level of private consumption expenditure was due to the inclusion of value of financial intermediation services consumed by households when they made deposits at banks and obtain loans (e.g. personal loans, credit card advances) from banks.

The upward revision to the level of net exports of services was due to the inclusion of value of financial intermediation services provided by resident banks to non-residents, e.g. loans to non-residents by resident banks, and deposits from non-residents. The substantial value of net exports of financial intermediation services reflected the role of Hong Kong in facilitating the channeling of funds within the region.

As the upward revisions to the level of GDP were broadly similar from one year to another, the revisions to the GDP rates of change in real terms were small (generally within +/- 0.2% point).

There were downward revisions to the value added shares of the economic sectors in GDP at factor cost. This was because under the latest guidelines, financial intermediation services consumed by the economic sectors could be estimated indirectly and deducted from the respective gross output figures. The import/export trade sector and real estate sector registered larger downward revisions because of the relatively large amount of loans for financing import/export trades and real estate development projects.

Value added shares of selected economic sectors in GDP at factor cost in 2003



Pedagogical Concerns of SAS Teaching*

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Introduction

Many people have the wrong perception that one can use statistical software to accomplish certain statistical tasks without having the need of a proper understanding of conceptual knowledge of statistics. On the contrary, the primary purpose of statistical software is to allow data analysts more focussed on the statistical thinking and leave the computational burden to machines.

Nowadays, IT has transformed the processes of data analysis (Young and Lubinsky, 1995). For instance, SAS (Statistical Analysis System) has been making use of IT, thereby reducing the usage of SAS syntax than before. SAS provides a variety of features for automating calculations and offers great flexibility to active exploration in a wide range of statistical processes. However, the teaching of SAS codes is very often over-emphasised by some lecturers without paying attention to a proper justification and/or interpretation of the SAS outputs. This discusses how to structure and underpin SAS learning in order to strengthen students' abilities to understand statistical processes and conduct proper statistical investigations; and how to assist students to form intellectual partnership with SAS in statistical investigations. In addition, the author discusses how well student learning in SAS teaching should be best fostered.

Structuring SAS Learning

SAS provides window-based environment, handy statistical tools and user-friendly features. From a statistical perspective, the strengths of SAS like other statistical software being beneficial to data analysts are limited (Cleveland, 2001). For example, SAS cannot detect semantic errors. SAS does not examine the relationship between a statistical problem and the statistical methods being employed. The examination task is beyond its capability and is left to SAS users (Chambers, 2000). To equip students with adequate SAS skills or related, it is necessary to structure SAS learning in line with a data analysis process. Moreover, the underpinning of SAS learning is done in association with attentiveness of what SAS being unable to do. Obviously, the incapability of SAS is beyond the obligations that should be undertaken by data analysts.

This article has been published in the Proceedings of SAS Academic User Group Conference in Asia 2005, p22-29.

Data analysis is an interactive process involving understanding of data; selection of statistical tools; utilising statistical software; checking correctness and meaningfulness of statistical output; interpreting statistical output; and compiling statistical results. To commence a statistical data analysis, data analysts should conduct a preliminary study on the types, format, content, context, measurement and measurement units of data. This preliminary study discloses which of the given data are relevant and useful to solving a data analysis problem, and provides general clues for what statistical tools ought to be chosen.

Prior to using SAS, data analysts must select correct statistical tools. Understanding data characteristics assists in selecting correct statistical tools to a certain extent because different statistical tools are developed for different statistical purposes and/or data characteristics. A wrong selection or misuse of a statistical tool can generate incorrect results and most probably leads to a non-meaningful or even an incorrect interpretation. Apart from checking these technical aspects, correct selection of statistical tools should also involve scrutinizing whether or not an interpretation of statistical results derived from a specific statistical tool reflects the contextual meaning.

SAS users must be aware of that SAS cannot detect semantic errors. A smooth run of SAS does not necessarily guarantee absolutely correct or accurate statistical results. Inaccurate results are generated for various reasons, such as rounding error, truncation error, computer platforms, algorithms and computer memory registry. Sawitzki (1994) reported that the same version of SAS yielded different results when running on different computer platforms. He actually compared three SAS modules, REG, GLM and ORTHOREG. Each of these modules employs different statistical algorithms and produces regression results in varying accuracy. Hence, SAS users should not totally accept statistical output without critically evaluating computational process.

Furthermore, data analysts should explore what are the underlying limitations of SAS about data range in a specific computer platform. For instance, McCullough (1999) found an error in SAS associated with an extremely small level of significance. In addition, SAS users should also consider how to modify or adjust the data in order to achieve the goal of a specific statistical task. For example, ill-conditioned data must be re-scaled prior to using regression SAS REG module in a regression model (Sawitzki, 1994).

Beyond checking computational performance, quality and accuracy, data analysts must be conscious of statistical logic when using SAS. That is, they must understand what the goal of a statistical task

is; what statistical computation is to achieve; how computers register numerical data; and how the logic of the strategy has been thought out. With statistical logic borne in mind, a negative value for a variance or a value greater one for a correlation coefficient are invalid values that can easily be spotted by competent data analysts. These two errors are not a matter of accuracy but a concern about whether a statistical answer is reasonable or unreasonable.

Interpretation is generally more than a superficial explanation of a statistical term and formula in a numerical context. Instead, data analysts need to take a deeper look at what statistical results really mean or actually measure, and deduce their practical meaning and/or implications. Thus, an inclusion of probabilistic view is vital when interpreting statistical results (Royall, 1999). For example, mis-interpretation of "significance" is commonly found (Jimenez, 1996). It is probably due to misconception about or incomplete understanding of the rationale for significance tests. The superficial interpretation of significance test in which it says whether or not the null hypothesis, H_0 is rejected, is neither convinced nor is related to a practical context. The rejection decision is merely made subject to contrasting the p-value with a pre-determined level of significance, α. This is an improper conception of the hypothesis testing being regarded as acceptance-rejection rules without taking account of probabilistic view namely, Type I or Type II error. Certainly, there is a need for organising the teaching of SAS along with evaluation of statistical evidence. To interpret statistical output meaningfully, students must understand how the results are derived and what they are representing for.

The dissemination of statistical results through written reports is a vital component of statistical work. Data analysts need to incorporate statistical results with other knowledge to make a decision, such as checking whether or not the quality of a certain product is satisfactory based on the testing of a sample of products when drafting a report. When students prepare their own reports, they generally need to organise their writings in such a way to ensure its logic is proper and the viewpoints presented are coherent.

Developing Intellectual Partnership with SAS

Human beings generally solicit external assistance to make sense of things they do not know and at the same time they are actively participating in the process of knowledge construction or fact finding (Bruner, 1985). Statistical software like SAS is a useful tool for assisting data analysts in understanding the real world by means of an active experimentation with data and wider exploration of data, but SAS does not prescribe and control a data analysis process.

The process of SAS learning has much to do with the framework within which students are developing intellectual partnership with SAS.

SAS streamlines a data analysis process particularly in the context of statistical modelling, SAS enables students to maintain a high level of interaction with the models they are building. They can manipulate the models from wider perspectives by making more interpretations and deriving meaningful representations of SAS output relating to a context induced by a given phenomena or relevant theory. SAS supports students in generating a direction or clue of advancing regression tasks and organising thinking towards model refinement.

Much of students' time and effort are devoted to mastering the procedural aspect of SAS rather than grasping the underlying concepts of statistical knowledge. As such, students are unable to tackle real-life statistical problems, not to mention their incompetence in presenting their findings in a proper and meaningful manner. Concepts, methods, techniques and communication are some core components of conceptual knowledge. According to Hiebert (1986), students must understand the language or symbol representation system of statistics as well as rules, algorithms or procedures used for statistical operations prior to programming SAS.

Students can use SAS to undertake technically difficult statistical analysis with the need for adequate statistical knowledge in order to evaluate strategies; compare perspectives; and regulate strategies for problem solving. Acquisition of conceptual knowledge is a dynamic process, totally different from learning without assimilation. Students are expected to learn and reflect on the knowledge by judging its implication, interconnection and utility. Students not only need to update, adjust and amend the existing knowledge but also to consolidate knowledge in an integrated manner rather than treating bits and pieces of knowledge as isolated entities. Newly learned knowledge should be fully integrated with the prior knowledge and bridged to experience before it becomes usable (Way, 1991). Only when knowledge is consolidated and its structures are organised in an integrated manner, higher-order thinking can then be facilitated.

To implement the above teaching ideas, constructivist theory is a preferred approach for promoting collaborative learning among students. A teacher can assign students challenging tasks, but they may be unable to accomplish the tasks on their own. With collaborative effort, students can resolve misunderstandings and achieve greater knowledge and better understanding.

Questionnaire-Based Survey

SAS learning was organized according to constructivist theory but how significant it was to help students understand the conceptual aspects of statistical knowledge was not clear. Of this, a questionnaire-based survey was conducted after 15 hours of SAS teaching in a computer laboratory. The aim of the survey was to collect students' perceptions of how constructivist theory supports learning activities that engages students with their learning partners. Among 33 Graduates of Higher Diploma in Mathematics, Statistics and Computing course who enrolled in an intensive SAS course, 30 had attempted the self-administrated questionnaire, constituting a response rate of 90.9%.

Research Findings

Among 30 students who had worked with their learning partners in an IT environment, 3 (10.0%) found very helpful, 22 (73.3%) found helpful, 5 (16.7%) had neutral responses, whereas none found either unhelpful or very unhelpful (Table 1). The positive views held by most students are supported by the context of collaborative learning in which students articulate their own beliefs; compare perspectives and belief of their learning partners; critically evaluate their ideas in the construction of their own plans; and regulate strategies for problem solving. This would eventually result in resolving misunderstandings and achieving greater knowledge and better understanding.

In Table 1, 20 (60.0%) students had better learning progress, 10 (33.3%) had neutral response, 1 (3.3%) student had worse learning progress, and 1 (3.3%) student had much worse learning progress when they were working with their learning partners. Most students had a better learning progress because they generally solicit external assistance to make sense of things they do not know, and at the same time they are actively participating in the process of knowledge construction. They may come up with counter proposals, discussion and negotiation so as to generate a direction or clue of advancing their learning tasks collaboratively.

In general, students liked to share knowledge with their learning partners. 2 (6.7%) students and 13 (43.3%) students shared very much knowledge and much knowledge with their learning partners respectively, 11 (36.7%) had neutral response and 3 (10.0%) students and 1 (3.3%) student shared little and very little knowledge with their learning partners respectively. Similarly, 1 (3.3%) student and 11 (36.7%) students found their learning partners shared very much and much knowledge with them, 15 (50.0%) had neutral response and 3 (10.0%) students found their learning partners shared little knowledge with them. But none found their learning partners shared very little knowledge with them (Table 1). To sum up, students liked to share knowledge with each other.

Among 30 students who had worked with their learning partners in an IT environment, 4 (13.3%) found communication with their learning partners very beneficial to learning process, 14 (46.7%) found beneficial, 12 (40.0%) had neutral response, whereas none found either unbeneficial or very unbeneficial (Table 1). The positive findings are well grounded from where students construct knowledge or solve learning problems by ways of student-student talk, thus enabling students to articulate, reflect and evaluate their thinking. Students' thinking can thus be developed from a wider perspective by making sense of what is being interacted with them.

In Table 1, 3 (10.0%) students found learning partners made learning process more fun, 12 (40.0%) students found fun; 13 (43.3%) students had neutral response and 2 (6.7%) students found learning partners made learning process threatening but none found very threatening. The implication of the positive findings is that making learning meaningful for students is a key issue in teaching and learning, thereby helping students to relate the new information to prior information and consolidate all information of different areas through interaction with their learning partners. Ultimately, students have a thorough understanding of the knowledge structure, the fundamental ideas and the inter-relationship among various concepts before knowledge can be fully utilised and retained.

Table 1. *A frequency table for responding to scales*

Responses	% of students responded (N=30)				
	1	2	3	4	5
Found learning with IT helpful/unhelpful when working with learning partners[1]	10.0	73.3	16.7	0.0	0.0
Had better/worse learning progress when working with learning partners[2]	0.0	60.0	33.3	3.3	3.3
Amount of knowledge student shared with learning partners[3]	6.7	43.3	36.7	10.0	3.3
Amount of knowledge learning partners shared[3]	3.3	36.7	50.0	10.0	0.0
Communication between student and learning partners beneficial/unbeneficial to learning process[4]	13.3	46.7	40.0	0.0	0.0
Learning partners made learning process more fun or more threatening[5]	10.0	40.0	43.3	6.7	0.0

Notes.

Owing to rounding, there may be a slight discrepancy between the sum of individual responses and the total as shown in the above table.

[1] Scale 1-5: "very helpful", "helpful", "neutral", "unhelpful" and "very unhelpful".

[2] Scale 1-5: "much better with learning partner", "better with learning partner", "neutral", "worse with learning partner" and "much worse with learning partner".

[3] Scale 1-5: "very much", "much", "neutral", "little" and "very little".

[4] Scale 1-5: "very beneficial", "beneficial", "neutral", "unbeneficial" and "very unbeneficial".

[5] Scale 1-5: "more fun", "fun", "neutral", "threatening" and "more threatening".

Conclusion

The power and advantage of using SAS should not be overstated because eye-catching displays on a computer screen do not necessarily facilitate learning and may even distract students from concentrating on their learning process (Mayer et al., 2001). SAS streamlines a data analysis process by providing a quick path in performing an exploratory data analysis to the validation of a proposed model. SAS users must have a considerable statistical knowledge and concepts, adequate statistical literacy and full awareness of the capabilities of SAS.

These research findings show that constructivist approach supports learning activities and illustrate how students acquire knowledge and develop understanding when interacting and communicating with their learning partners.

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News

Census and Statistics Department

With effect from 11 August 2005, Mr. FUNG Hing-wang, assumes the office of Commissioner for Census and Statistics vice Mr. Frederick HO Wing-huen on pre-retirement leave. Mr. Dominic LEUNG Kam-to assumes the office of Deputy Commissioner for Census and Statistics vice Mr. FUNG Hing-wang.

2005 Hong Kong Statistical Conference

The 2005 Hong Kong Statistical Conference organised by the Hong Kong Statistical Society is to be held on 17 December 2005. Contributed papers are called for presentation at the Conference. Deadline for submission of abstract of paper to be presented in the Conference is 1 October 2005. For more information about the Conference, please visit the Conference website at http://www.hku.hk/statistics/HKSS2005/.

The 5th IASC Asian Conference on Statistical Computing

The 5th IASC Asian Conference on Statistical Computing co-organised by the International Association for Statistical Computing (IASC), Asian Regional Section, Dept of Statistics & Actuarial Science, University of Hong Kong, and the Hong Kong Statistical Society will be held in 15-17 December 2005. Contributed papers are called for presentation at the Conference. Deadline for submission of abstract of paper to be presented at the conference is 1 October 2005. For more information about the Conference, please visit the Conference website at http://www.hku.hk/statistics/IascAsian05/.