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A news update on research activity at SMU

inside this issue

Doing Good Research in the Face of "Missing Data"

Associate Professor Denis Leung
School of Economics and Social Sciences

All statistical analysis requires the availability of good data sets. Yet, in most studies, it is not easy to obtain a complete data set. Incompleteness may be attributed to a random phenomenon or by design. In some data collection process, because of cost considerations, either in time or monetary terms, only limited information on the sample is collected. Incompleteness may also be non-random. For example, some respondents may refuse to give information relating to sensitive personal issues, such as income or sexual preferences. Whatever the sources of data incompleteness, it poses a serious problem for researchers. At best, incompleteness reduces the accuracy of results from the studies; at worst, it could lead to biased conclusions.

In recent years, Prof Denis Leung has spent much time finding ways to deal with the problem of "missing data". In particular, he has extensively studied the use of surrogate data to recover information lost through missing data. Surrogate data are proxies of the intended but missing data. For example, a proxy for household income may be the home address and a proxy for household spending may be the household size. Even though a surrogate does not directly provide the intended information, it nevertheless provides some information about the missing data.

According to Prof Leung, in some cases, researchers might in fact prefer to use surrogate data rather than the actual intended data. Quite often, surrogate data are much cheaper and easier to obtain than the actual data. Furthermore, it is conceivable that surrogate data could provide more accurate information than the actual data, even if the latter were available. For example, in surveying the sexual preferences of individuals, the information obtained from posing the direct questions to the interviewees may not be as accurate as those provided by surrogate data.

There are two fundamental steps involved in the attempt to recover information through the use of surrogate data, said Prof Leung. The first step is to establish the relationship between the missing data and the surrogate data, through the use of some models. This is often a difficult task as the modeling is targeted at data that is already "missing". The second step, once a model has been chosen, is to "fill in" the missing data using the surrogate. The "complete" data thus obtained is then used for research purposes.

As Prof Leung noted, the process of information recovery must fulfill two objectives: it must be robust to errors in specification and it must also be efficient. Unfortunately, in most practical situations, these two aims cannot simultaneously be satisfied. In other words, a very robust approach is bound to be inefficient and vice versa. "The challenge is to come up with models that strike a good balance between these two aims", he said, "Meeting such challenges has been the focus of my work in the past few years."

Specifically, Prof Leung has focused on using models that require as few assumptions as possible, through a method called *empirical likelihood*. "An advantage of this method is that it combines the "filling in" and the analysis in one step," he said. In his studies, he found that the method could recover almost all the information lost as long as the surrogate data are "representative" of the intended but missing data. In addition, he found that this method will not be worse than any other method that does not make use of surrogate data, even when the surrogate is completely unrelated to the intended data.

Examples of Prof Leung's works may be seen in two recent publications: "*Information recovery in a study with surrogate endpoints*" in Journal of the American Statistical Association 2003 98: 1052-1062 (with Chen, S.X. and Qin, J) and *Estimation with survey data under nonignorable non-response or informative sampling* in Journal of the American Statistical Association 97: 193-200 (with Qin, J. and Shao, J). ■

Do Sell-Side Analysts Have Sharper Insight into a Company's Future Earnings Than an Average Investor?

Assistant Professor Yong Keun Yoo
School of Accountancy

Sell-side analysts play a prominent role as information intermediary in the capital market. They receive and process information from diverse sources and then communicate the information to investors in concise forms like earnings forecasts. Such forecasts form the basis of their stock recommendations. By providing a publicly available and easily accessible benchmark, the sell-side analysts often have strong influence over investors' earnings expectations and their investment/trading decisions.

Investors are often said to be suffering from the phenomenon of "accrual anomaly". That is, their expectations of a firm's future earnings and hence the prices they are willing to pay for a stock tend to be affected by the proportion of the firm's non-cash earnings. The higher the non-cash portion, the more likely investors will over-estimate the firm's future earnings. Would such a problem of biased forecast be less severe if investors were to rely on sell-side analysts instead?

Not according to Assistant Prof Yong Keun Yoo. In his dissertation thesis at Columbia University, he finds that, as far as the problem of "accrual anomaly" is concerned, sell-side analysts are even more biased in their earning forecasts than investors. Moreover, their (greater) bias tends to persist for at least a year, further exacerbating the mis-pricing of stocks. Thus, if investors were to use the analysts' earnings forecasts as the basis of their earnings expectations, and trade based on that information, they would more likely lose money than make money.

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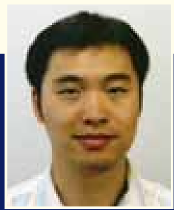
Prof Yoo attributes the seemingly counter-intuitive result to a number of factors. Firstly, being employees of brokerage houses and investment banks, analysts may not be able to separate their own views from that of the firms they work for. Often, it may not be in the analysts' interests to mitigate their biased earning forecasts. They may also have an incentive to promote the purchase of certain stocks, rather than to produce the most accurate earnings forecasts. Secondly, the timeliness of analysts' earnings forecasts determines their usefulness as a signal for the market's mispricing of accruals. However, analysts may tend not to revise their earnings forecasts so quickly. Doing so may be seen to undermine their reputation for consistency in the market.

Prof Yoo said that his findings may help investors better understand the usefulness and/or limitation of analysts' earnings forecasts as they make their investment decisions. They also help sell-side analysts make better earnings forecasts by mitigating their misinterpretation of the various earnings components. In addition, the findings point to the need for accounting policy makers to improve the quality of the financial statements, since the other information intermediaries in the market including the analysts do not sufficiently supplement the imperfect role that the financial statements play as a conveyer of information. ■



Taking another Look at the Risk-Return Relationship in Stock Market Investment

Assistant Professor Zhang Zhe, *Lee Kong Chian School of Business*

In investment, it is well understood that higher returns are associated with higher risks. Financial analysts make a distinction between two types of risks: those associated with the whole market (market risk) and those associated only with the specific asset in question (idiosyncratic risk). It is well known that in general, the expected returns on assets relate only to the market risk, because idiosyncratic risk can be largely eliminated by holding a large, well diversified portfolio. However, if investors cannot hold the "market" portfolio- the portfolio that includes all the assets in the economy and therefore reflects the characteristic risk of the whole economy -- the idiosyncratic risk will not be fully hedged away. In such a case, the expected returns will be related to idiosyncratic volatility. It is possible that at the aggregate level, the return on a market portfolio may be related to the average idiosyncratic volatility (risk).

Recent empirical evidence shows that idiosyncratic volatility on average in the US market has increased significantly while the volatility of the market portfolio (proxied by NYSE/AMEX/NASDAQ composite index) has remained stable[1]. Some studies including one by Goyal and Santa-Clara[2] claim that there is in fact a positive relationship between future excess return on the market and the average total volatility which is accounted for largely by the idiosyncratic volatility. In layman's term, this means that if investors are willing to take on more idiosyncratic risks, they could reap higher returns from their investment. "This is potentially a very significant finding-any variable that predicts future market return attracts people's attention, especially in this case where the finding has bearing for the basic tenets of modern portfolio and asset pricing theories." said Assistant Prof Zhang Zhe from the Lee Kong Chian School of Business.

Unfortunately, things are not so straight-forward, according to Prof Zhang. In a recent paper he co-authors with Turan Bali, Nusret Cakici and Sterling Yan ("Does idiosyncratic volatility really matter?" Journal of Finance, April 2004), he finds that the positive relationship between excess market returns and idiosyncratic risks is not as robust as Goyal and Santa-Clara had claimed. In fact, the relationship weakens considerably when it is applied to different sample periods and stocks traded at different exchanges.

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In addition, Prof Zhang found that the claimed relationship hinges on the assignment of equal weights to all stocks when the researchers average out the idiosyncratic volatility. Equal-weighting puts relatively more weight on small-cap stocks (stocks with less market value). This ignores the fact that small-cap stocks are on average less frequently traded, and that the volatility measure is vulnerable to changes in the bid-ask spreads. The result of using the equal-weight measure is that it could "spuriously inflate" the level of the average idiosyncratic volatility in the market.

"We believe that a crucial factor to take into account, when using equal-weighted measure of idiosyncratic volatility, is the liquidity premium of the stock," said Prof Zhang. When liquidity is poor, the bid-ask spread and hence the price volatility will be high. If small-cap stocks are given a heavy weight in the average, it could well lead to the increase in the spurious volatility (and hence the average market idiosyncratic volatility) that we witness in recent years. Indeed, after adjusting for expected and unexpected illiquidity, Prof Zhang found that the strong relationship between market returns and idiosyncratic risks disappears.

Taking the issue one step further, Prof Zhang and his co-authors suggest that a market value-weighted approach (assigning more weight to larger stocks) provides a more appropriate measure for idiosyncratic volatility, for several reasons. Large stocks are economically more important than small stocks. In addition, even if the idiosyncratic risks could not be fully diversified away, larger firms tend to face more idiosyncratic risks (such as human capital risks) than smaller firms. Indeed, when they re-ran the test using the value-weighted volatility measures, Prof Zhang found no evidence of the significant link between portfolio returns and stock volatility that previous researchers claimed.

To improve the robustness of their findings, Prof Zhang et al also take into consideration relevant factors such as lagged return, dividend yields, interest rates, term-spread, and default spread etc. Furthermore, they constructed a "pure" idiosyncratic volatility measures and used it to separate the different effects of firm size, liquidity, and price level. "All our main findings remain robust," said Prof Zhang.

In summary, Prof Zhang noted that although the average idiosyncratic volatility has increased significantly over the past four decades, the increase has not translated to a stronger relation between the future market excess return and the average idiosyncratic volatility. He cautioned however that the conclusion does not necessarily apply to the relationship between return and idiosyncratic volatility at the firm level. On the contrary, preliminary findings in another study[3] suggest that the unexpected idiosyncratic volatility plays an important role in explaining the returns at the individual firm level. ■

1 See for example, a study by John Campbell, Martin Lettau, Burton Malkiel, and Yexiao Xu, 2001, *Has individual stocks become more volatile? An empirical exploration of idiosyncratic risk*. Journal of Finance, 56, 1-43.

2 See for example, a recent study by Amit Goyal and Pedro Santa-Clara, 2003, *Idiosyncratic risk matters!* Journal of Finance 58, 975-1008.

3 Chua Choong Tze, Jeremy Goh, and Zhe Zhang, Expected volatility, Unexpected Volatility, and Stock Returns, SMU Working Paper, 2005.

Getting the Optimal Results through Proper Scheduling

Practice Associate Professor Brian Rodrigues, *Lee Kong Chian School of Business*

Transport operators face the perennial problem of "scheduling" in their attempts to obtain optimal results and save costs. In a series of recent papers, Prof Rodrigues together with other research collaborators sought to provide solutions to such scheduling problems in various industries.

The first paper, "Crane scheduling with spatial constraints" (with A. Lim and Y. Zhu), published in *Naval Research Logistics Quarterly* Volume 51 (3) (2004), looks at a particular scheduling problem in container ports. In today's competitive port operations industry, ships must be serviced quickly and efficiently. During the short berthing time, containers must be unloaded by quay cranes onto movers, to be transported to storage locations. In this operation, containers are stored in stacks and transportation lanes can get congested. The paper looks at how the assignment of particular containers to certain cranes and the scheduling of such assignment can help optimize the total amount of cargo processed in a given period. "This is the first study of crane scheduling that takes into account limitations resulting from structure and space," said Prof Rodrigues.

The complexity of the problem arises because of a number of spatial constraints which limit the possibilities of assigning cranes to containers. Firstly, cranes cannot cross over each other since they usually move on the same tracks. Although this seems uncomplicated, it is a big disadvantage when making assignments. Another constraint arises from the requirement that cranes be separated i.e. to have some space to move around while they are in operation. The effect of this is that containers next to each other may be left unassigned even if the cranes are free. Yet another limitation is that certain containers cannot be used simultaneously. For example, containers bound for the same location require time separation to avoid congestion in lanes.

In their paper, the authors showed that solutions to this computationally complex problem can be found in the form of dynamic programming algorithms and computational heuristics. "We are pleased that the programs have proven to be effective in obtaining solutions while providing answers quickly enough to be of use to operators in real-life situations," said Prof Rodrigues.

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The second paper, "Airport gate scheduling with time windows" (with A. Lim and Y. Zhu), published in *Artificial Intelligence Review*, Volume 24, No 1 (2005), tries to answer a question that all airport operators face: which gates to assign to which flights? Assuming that the arrival and departure times of various flights can be changed during the planning period, the authors developed a model which can be used to optimize the travel time (costs) for passenger between gates in a busy airport, or to minimize the costs of handling materials such as baggage and cargo assignments. The model can also be applied to cross-docking optimization in areas such as transshipment through freight terminals. In the latter situation, the arrival times via trucks or ships of the materials may fluctuate and yet these materials must be assigned to gates to be unloaded and then picked up for further carriage. In the paper, the authors propose an approach using the memetic algorithms and the local search techniques. According to Prof Rodrigues, the computational results show that the technique works very well and in fact better than some of the best commercial programs available!

Scheduling solutions can be applied to the assignment and grouping of workers too. Most business projects require workers with varied skill sets to work as a team. Each team member with a specific skill set may be required at different times in different locations. An efficient scheduling of assignment of workers to different teams can be worked out to help minimize the operating costs. For example, a media company may be shooting programs at various sites. Each site may need a number of directors, coordinators, cameramen, lighting staff, recorders, technicians and stage workers. But these workers' usefulness is not specific to any particular site or program production. They can be deployed inter-changeably among the various sites.

In such a situation, it is important to schedule the arrival and deployment of each worker at different sites efficiently. This is the issue that Prof Rodrigues (with A. Lim and Y. Li) studied in a paper entitled "Manpower allocation with job teaming constraints". The results will be published in *Naval Research Logistics Quarterly*. ■

New Findings in Financial Economics and Econometrics

Professor Tse Yiu Kuen, *School of Economics and Social Sciences*

The year 2004 has been another productive year of research for Professor Tse Yiu Kuen. Among the articles he has published in top-rank professional journals are three that deal with various aspects of econometrics and finance.

In the first paper, ("A Small-Sample Overlapping Variance-Ratio Test", by Y.K. Tse, K.W. Ng and X. Zhang, *Journal of Time Series Analysis*, 2004, 127 - 136), Prof Tse looks at a new way of testing the random walk hypothesis in short macroeconomic time series data. A conventional measure to test the hypothesis in the economic and finance literature is the variance-ratio statistic. But there are problems associated with the use of such a statistic in macroeconomic time series, which typically have rather small samples. In particular, the null distribution of the overlapping variance-ratio test is known to be downward biased and skewed to the right in small samples.

In this paper, Prof Tse and his co-authors propose a modified overlapping variance-ratio statistic and derive its exact mean under the normality assumption. They propose to approximate the small-sample distribution of the modified statistic using a beta distribution that matches the mean and the variance. A Monte Carlo experiment was performed which shows that the beta approximation performs well in small samples. "The results of this paper will help facilitate tests for the random-walk hypothesis for short macroeconomic time series," said Prof Tse.

In the second paper, ("Estimation of Hyperbolic Diffusion using MCMC Method", by Y.K. Tse, X. Zhang and J. Yu, *Quantitative Finance*, 2004, 158 - 169), the authors propose a new method to estimate a continuous-time financial model that can describe many stylized properties of equity returns. In the financial econometrics literature, a number of stylized facts have been well documented to describe the statistical properties of equity return series. Several discrete-time models have been found to be able to generate time series with such stylized properties, making them very useful in analyzing equity returns. However, the same cannot be said about the continuous-time models. Few of them are able to successfully generate the same stylized properties. One exception is the so-called hyperbolic diffusion model, which can accurately describe equity price data and be applied to option pricing.

In this paper the authors found that the hyperbolic diffusion is also capable of reproducing other stylized facts documented in the financial econometrics literature such as the Taylor effect, a slowly declining autocorrelation function of the squared returns, and thick tails. "This finding shows that the hyperbolic diffusion model is much more useful in financial studies than many had previously thought," said Prof Tse.

In addition, the authors propose a new approach to estimate the hyperbolic diffusion model. Due to the lack of knowledge of the transition density, econometric estimation of the hyperbolic diffusion model using the exact likelihood approach has always been intractable. The authors propose to use the Markov chain Monte Carlo (MCMC) method to estimate the parameters of the hyperbolic diffusion. They demonstrate that the MCMC method provides a useful tool in analyzing hyperbolic diffusions. In particular, quantities of posterior distributions obtained from the MCMC method can be used for statistical inference.

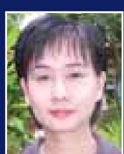
The third paper ("Market Segmentation and Information Values of Earnings Announcements: Some Empirical Evidence from an Event Study on the Chinese Stock Market", by Y. Gao and Y.K. Tse, *International Review of Economics and Finance*, 2004, 455 - 474) is an empirical study on the effects of earnings announcements on the prices of A- and B-shares in the Chinese stock exchanges, where the earnings reports are prepared under different accounting standards.

Two types of shares are listed and traded in the two stock exchanges (Shanghai Stock Exchange, SHSE and Shenzhen Stock Exchange, SZSE) in China: A-shares, which are issued strictly to the Chinese citizens and B-shares which are issued only to foreigners (this restriction applied prior to 2001 but has been later relaxed). The A- and B-share markets are thus segmented, causing high price premiums of the A-shares relative to the corresponding B-shares, although the owners of the A- and B-shares have the same rights. Interestingly, while International accounting standards (IAS) are used to prepare the accounting reports for B-shares, it is China's accounting regulations, the so-called PRC generally accepted accounting principles (PRC GAAP), that are used to prepare accounting reports for the A-share holders.

In this paper, the authors use the event study methodology to examine the different effects of the earnings announcements on the A- and B-share prices, using earnings numbers that are prepared under different accounting standards. Their results point to significantly abnormal returns and trading volumes during the windows of earnings announcements, which is consistent with previous research findings that earnings information is value relevant in the Chinese stock market. Moreover, the abnormal trading volumes in the A-share market are found to persist for a longer period than those in the B-share market.

More interestingly, Prof Tse and his co-author found that Chinese investors respond mainly to earnings figures prepared under PRC GAAP, and less so to information prepared under IAS. Using the earnings numbers prepared under PRC GAAP, for example, they found significantly positive abnormal returns in the good-news event window and significantly negative abnormal returns in the bad-news event window for both the A- and B-shares. With the earnings compiled under IAS, however, they found similar abnormal returns only in the B-share market. In the A-share market significantly negative abnormal returns are observed in the bad-news window but no significantly positive abnormal returns are found on the good-news event day. Thus, good news and bad news do not have different effects on the Chinese local investors. The investors' reactions to the two types of information are similar. "This makes us wonder whether the reported accounting numbers have any meaning for the Chinese local investors at all?!" said Prof Tse. ■

Sequencing Economic Integration in East Asia



Practice Associate Professor Chow Hwee Kwan, *School of Economics and Social Sciences*

Assistant Professor Peter Nicholas Kriz, *School of Economics and Social Sciences*

Practice Professor Augustine H H Tan, *School of Economics and Social Sciences*

Professor Roberto S. Mariano, *Dean, School of Economics and Social Sciences*, *Vice Provost for Research*

The East Asian economies have become more interdependent over time, with rising trade and investment within the region. Official efforts have played a significant part in bringing about the closer integration of the regional economies. One of the key questions that confront policy makers is what sequence reforms in different segments of the economy should follow. It is well recognized that a careful sequencing of trade, investment and financial integration is not only necessary to ensure coherence and complimentarity in the integration efforts, but is also critical for growth and financial stability in the region.

In a recent study carried out under the auspices of the ASEAN+3 Research Group project *Trade, Investment and Financial Integration in East Asia*, Practice Associate Professor Chow Hwee Kwan from the School of Economics and Social Sciences (together with Peter Kriz, Roberto S. Mariano and Augustine Tan from the same school) provides some insights and policy recommendations on such sequencing issues.

Prof Chow argues that, insofar as the regional trade agreements (RTAs) are concerned, there should be a natural expansion from manufacturing products, to other goods and services. East Asia should push as vigorously for liberalization of trade in services as they have for manufacturing goods. Indeed, to realize the gains from trade liberalization in the manufacturing sector, reforms in services sectors such as transportation and communication are necessary. For example, a reduction in cross-border transaction costs brought about by services sector deregulation is necessary in ensuring the efficient distribution of production of goods into the regional production networks.

Following the liberalization of the trade in services, the RTAs should extend further to encompass investment agreements. Trade agreements which enlarge market size and reduce imported input costs are almost certain to attract export-oriented FDI. The presence of multinational corporations (MNCs) also creates trade in intermediate components and finished products between the parent corporations and their foreign affiliates. "Trade and investment policies need to be coordinated in order to provide mutual support for each other," said Prof Chow.

Prof Chow argues that, insofar as the regional trade agreements (RTAs) are concerned, there should be a natural expansion from manufacturing products, to other goods and services.

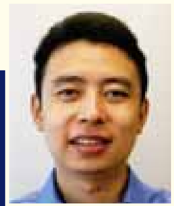
On the speed of integration, Prof Chow argues that East Asia should adopt a "multi-speed" approach. Since the process of liberalization often requires adjustment in different sectors, countries whose capital and labor are less sector-specific and entrepreneurs more adaptable will have lower adjustment costs. As such, they could integrate first. However, to avoid inconsistency in trade rules, design for any sub-regional RTA should maintain a certain degree of conformity with the World Trade Organization (WTO) principles. It should also encompass a forward-looking element to accommodate future enlargement of the RTA.

The creation of new RTAs will inevitably alter the relative competitiveness of exporting firms within East Asia. Firms that are adversely affected will likely lobby for greater scope of negotiations in order to protect their own interests. Potentially, this has the benefit of inducing further enlargement of trade liberalization.

While some progress has been made with integration in trade, East Asia is only in the early stages of financial integration. Cross-country financial market linkages heighten the speed and magnitude of international spillovers and may potentially increase the vulnerability of individual countries to external financial shocks. As such, Prof Chow argues that any regional financial integration must be preceded by domestic financial sector reforms, regardless of the progress of trade and investment integration. Without financial deepening and its requisite institutional reforms such as the development of legal, accounting, supervisory and regulatory mechanisms in the domestic market, the benefits of regional financial integration are debatable.

To resolve such a dilemma, Prof Chow argues that countries could start with some weak forms of financial cooperation such as technical assistance and information sharing. But these types of financial cooperation should be seen as stepping stones towards stronger-form coordination which should ultimately feature independent supranational institutions with regulatory and supervisory oversight.

The paper also dwells on the question of how exchange rate cooperation could best support trade and investment integration. The authors suggest that East Asian monetary authorities should begin by increasing domestic exchange rate flexibility, to allow individual countries to better accommodate adjustments arising from regional economic integration. Policymakers should also recognize that the economic diversity of the region will necessarily imply a diversity of optimal sovereign monetary policy regimes. "When contemplating regional monetary cooperation," Prof Chow noted, "Monetary authorities should broaden the scope beyond exchange rate management. They should take into account the fiscal, strategic and industrial policy dimensions of the issue." ■



Does Asymmetry in Stock Returns Matter? You Bet!

Assistant Professor Tu Jun, *Lee Kong Chian School of Business*

In the US stock market, individual stock prices move with the market more often when the market goes down than when it goes up, pointing to a certain asymmetric correlations between individual stock returns and market indices. Such asymmetry could potentially cause problems in hedging since effective hedging depends crucially on certain stability in the correlations between the assets hedged and the financial instruments used. It could also affect the effectiveness of portfolio diversification if all the stocks were to fall as the market declines.

According to Assistant Professor Tu Jun, testing asymmetric correlations is not an easy matter at all. "When a computed correlation is conditional on some variables being high or low, that correlation becomes a biased estimator of the unconditional correlation," he noted, adding that a formal statistical test is needed to account for both sample variations and the bias induced by conditioning.

Yet, as Prof Tu pointed out, existing formal tests are far from satisfactory. These tests generally involve selecting a statistical model for the data first. They then compare the conditional correlations of the sample with those implied by the selected model. If there is a large difference, the test concludes that the data cannot be explained by the model and are thus not symmetric. "The weakness of this approach is that it answers only the question of whether the asymmetry can be explained by a given model, but leaves unanswered the question of whether the data is asymmetric at all," said Prof Tu. In other words, a rejection of symmetry may be due to the rejection of a specific model rather than to the symmetry of the data itself.

Such dissatisfaction with the existing tests prompted Prof Tu to look for a better alternative. In a recent paper written with Yongmiao Hong and Guofu Zhou ("Asymmetries in Stock Returns: Statistical Tests and Economic Evaluation," 2005, under consideration by the Review of Financial Studies), he proposed a new statistical test for asymmetric correlation in data. The novelty of the proposal is that it is model-free. That is, one can use the test without having to first specify a statistical model for the data. "This means that if symmetry is rejected by our test, then the data cannot be modeled by any symmetry distributions," said Prof Tu.

The paper also applies the new methodology to assess the economic importance of asymmetry in stock returns data in the US market. Specifically, the methodology was used to test three different sets of portfolios grouped by market capitalization, by book value-to-market value ratio and by industry, respectively. The authors found that asymmetric correlations are statistically significant primarily for small size portfolios. "In spite of the modest statistical evidence, we find that the economic value of incorporating the asymmetric characteristics into portfolio decision making is in fact very substantial," said Prof Tu. In particular, an investor can obtain an additional annual return of over 2% if he takes into account the asymmetry in equity returns data. "In short, our findings suggest that asymmetry matters in the US stock market," Prof Tu said. ■

Can Greater Internationalization Help a Firm Improve its Performance?

Assistant Professor Jane Lu, *Lee Kong Chian School of Business*

Firms that are pursuing an internationalization strategy often encounter problems they have not seen before. In a series of recent papers, Assistant Prof Jane Lu explores some of these issues and their practical implications.

In the first paper (*International Diversification and Firm Performance: An S-Curve Hypothesis*. Academy of Management Journal, 2004, 47 (4): 598-609), Prof Lu (with Paul W Beamish) look at the relationship between the degree of geographic diversification and the firms' financial performance. She found that the relationship takes a non-linear form. At high and low levels of internationalization, the extent of geographic diversification was negatively associated with firm performance, while at moderate levels of internationalization, greater geographic diversity was accompanied by higher performance.

"These findings suggest that managers need to take a long-term view in internationalization," said Prof Lu. In the initial stages, there might not be immediate positive returns from foreign expansion. In fact, a firm may even suffer a decline in profits. But this should not discourage the firm from continuing its internationalization efforts, as long as the management devotes adequate attention to ameliorating the initial disadvantages of being new and foreign.

At the same time, Prof Lu believes that managers should also recognize the downside of excessive international expansion. "They should be proactive in the design and implementation of their international strategies, especially the structure of the subsidiary networks, so as to keep the level and scope of internationalization at their optimal levels," she said. In pushing internationalization and the operational complexity that entails to a higher level, the management should ensure that the management capability of the firm does not fall short.

To fully realize the benefits of greater internationalization, Prof Lu suggests that the firm continues to adjust its organizational structures/systems to handle the coordination problems that arise with increases in the number of overseas subsidiaries. "Since learning in the international environment tends to be incremental, we could see initial decrease in profitability associated with new complexities that come with a higher level of international expansion, followed by increase in profitability as the management learns to manage the new complexities," she noted.

The paper also looks at the importance of intangible assets to a firm's internationalization strategy. A firm's reputation can precede its entry into a foreign market. Just as many exporting firms started exporting as a result of a welcome but unsolicited export order, firms that invest internationally may learn that their reputation for possessing strong intangible assets (patents, brands, etc.) has preceded their arrival. Often, customers, suppliers, the business press and potential partners have already determined which foreign firm is a leader, regardless of whether the investment has taken place.

In another paper (*Foreign Control and the Survival of Joint Ventures: A Contingency Approach*. 2005. Journal of Business Research, forthcoming"), Prof Lu (with Louis Hebert) investigated the equity control-subsidiary performance relationship in international joint ventures (IJVs). She found that the payoffs of equity control emerged more clearly in the presence of technology-intensive assets. In such cases, an increase in foreign equity control tends to stabilize the operation of the IJV. This finding in turn allows her to highlight some key elements in the design of an efficient governance structure in IJVs.

One such key element is the need to account for concerns about the appropriability hazards, particularly in the presence of technological assets. There are basically two ways to address this concern. One is to rely on the appropriability regime of the host country to provide protection for the rents from the technological assets. The other is to design and negotiate an appropriate governance structure to guard against such hazards. Prof Lu's findings suggest that a strong governance structure would be more efficient in combating the appropriability hazards in IJVs involving technological elements and in host countries where the appropriability regime is weak.

At the same time, Prof Lu notes that firms need to consider the costs that are associated with high levels of equity control by foreign firms. These costs may include constraints on resources, the lack of flexibility and the lack of motivation of local partners to contribute to IJVs. Indeed, her findings suggest that higher-control structures may not be efficient when there are alternative ways to monitor the behaviors of the IJV partners. Specifically, firms can use social knowledge accumulated through experience as a substitute for equity control. In this way, firms can economize on the costs from high levels of equity ownership and achieve better performance.

In a third paper (*Partnering Strategies and Performance of SMEs' International Joint Ventures*. 2005. Journal of Business Venturing, forthcoming."), Prof Lu (with Paul Beamish) examine the effectiveness of international joint ventures (IJV) as an internationalization strategy for small and medium enterprises (SMEs). Specifically, she looks at the different effects that the experience and the size of the IJV partners have on the IJV performance, in terms of profitability and longevity.

As far as the firm's experience is concerned, Prof Lu found that host country knowledge from the local partners is more important than that from the home country partners in improving the IJV's profitability. "SMEs that are venturing overseas should therefore explore opportunities to seek partnership with local firms so as to benefit from the immediate local access such a tie-up provides." she noted.

In terms of the size of the firms, Prof Lu found that having large firms as partners could play an important role in overcoming the problems associated with the newness and smallness faced by the SMEs in their internationalization efforts. This is important in helping the IJV to achieve longevity. But Prof Lu cautions that SMEs should weigh the advantage in longevity against the potential loss in profitability when they partner with larger firms which have stronger bargaining power. The paper also looks at the importance of the type of resources contributed by IJV partners. To promote IJV longevity, Prof Lu argues that SMEs could contribute a diverse and continuing set of resources to reduce the chances of obsolescence of the initial IJV bargain. ■

Allocating Limited Inventory to Achieve Maximum Customer Satisfaction: The Use of Dynamic Pricing and Discounts

Assistant Professor Ding Qing
Lee Kong Chian School of Business

Given the limited inventory of products that a firm may hold at any time, it is always a challenge for it to decide on the priority with which to serve its various customers. Typically, the firm has to determine not only how much inventory to allocate in each period and the priority in serving the demand, but also the incentives (like discounts) to offer to customers who do not enjoy any priority. Assistant Professor Ding Qing refers to such a problem as the "Allocation, Discounting and Prioritization (**ADP**) problem".

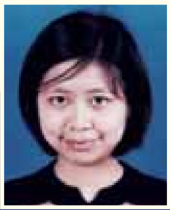
The ADP problem is common in many industries. At the distribution center of a wholesaler of industrial products, for example, orders are received throughout the day from customers who expect same day delivery. Given the limited inventory, the distributor may choose to offer the customer (with low priority) next day delivery, hoping that additional inventory could be obtained overnight. As an incentive for the customer, the distributor

The different customer classes are distinguished by the prices they pay and their willingness to wait for delivery in a subsequent period.

may offer him a discount. Similar problems are found in on-line and catalog businesses. In some cases, customers arriving early in the day may be quoted a longer delivered time so that the inventory may be reserved for customers coming later in the day with higher valued orders.

While there have been many attempts in the past to offer solution for ADP problems, most have their own weaknesses. In a recent paper ("*Dynamic pricing through customer discounts for optimizing multi-Class customers demand fulfillment*", with co-authors Panos Kouvelis and Joseph M Miller, forthcoming in *Operations Research*), Prof Ding provides an alternative solution. He models the situation as a dynamic pricing issue with price discounts as an incentive, while allowing for the possibility of partial backlogging of unfilled demand. The different customer classes are distinguished by the prices they pay and their willingness to wait for delivery in a subsequent period. Demand from each customer class is modeled as a realization of a (non-stationary) random variable during each of several stages within a period. The firm is able to view this demand in each stage prior to making an allocation decision on which demand to fill. Unfilled demand may then wait for later fulfillment. The probability of this occurring is influenced by the discount the firm offers to the customers as well as some customer class-specific parameters.

Unlike some previous models, Prof Ding and his co-authors are able to incorporate dynamic price discounting (i.e., offering economic incentives for customer retention fully reflecting all available inventory and realized demand information) with inventory rationing in a model which can be solved in an efficient manner. Compared with a simple first come-first served (FCFS) model without backlogging, there are certain advantages in using the new model. Firstly, it brings higher profits, due primarily to appropriate inventory allocation. Secondly, the offer of discounts to customers who have been denied immediate service ensures that the overall service quality is maintained at a certain level. The discounts also provide buffer for the subsequent stages if demand does not materialize. "Our model can address the real time revenue management needs of distributors, whether you are talking about agile distribution or direct-to-market channels," said Prof Ding. ■



New Methods for Composing Complex Web Services

Assistant Professor Althea Liang, *School of Information Systems*

The functions of the Web have evolved significantly over the years. From being a mere source of data, it has become also a source of applications providing services for various types of users (e.g. Google for content search, Expedia for travel requests, Interflora for flower delivering and Amazon for e-commerce related search and purchasing activities). The evolution is accompanied by the emergence of the *Web service* technology, to meet the increasing needs of sharing these application resources. The technology provides an easy interface for different software and application systems to operate together. It also allows organizations to share data, software and hardware resources over the Internet.

Web services are defined as "network endpoints operating on messages containing either document or procedure oriented information"[4]. Within the Web service model, a software agent can play one or all of the following three roles: service providers, service requestors and service registries. Service providers own their services and host accesses to the services. Service providers register with the service registries and advertise services in the service registries. Service requestors are human users or client programs looking for services in the registries. A key concern in the operation of Web services is to make it easy for users to share resources. This is done by having service registries that have well-defined places for publishing on the one hand, and for finding required services on the other, in a standardized understandable language.

Assistant Professor Althea Liang believes that the next natural step of progression would be to 'assemble' the existing functions into a composite service package, although this may not be so easily done. In the current Web service model, for example, registered Web services can not be dynamically combined to form composite services, as certain individual services may fail to meet the more complex demands of some service requestors. To offer composite services, the current Web service model has to be extended to include the mechanism of "composition". In addition, some automation technology for the composition process must be available.

We hope to improve both the dynamics and applicability in reusing available software and thus promoting the use of complex, composite Web services by the business sectors for e-commerce applications.

Some form of extension has already been done. This involves introducing to the standard Web service model an *Intelligent Service Registry* capable of constructing or discovering composite services dynamically, as well as an add-on component (called the *Composite Service Processor*) which is capable of invoking composite services discovered. This type of extended model provides an explicit mechanism allowing composite services to be studied in the same framework as simple Web services.

More difficult is the challenge of providing some automation technology for the composition process. Recent research has looked at the possibility of both the manual and the automatic composition. But both lines of research are contingent on some stringent assumptions regarding the capability of the service requestors, making the approaches not feasible and the result not precise. To resolve this problem, a semi-automatic approach was proposed to dynamically compose services. Simply put, in this approach, an iterative and interactive process built on top of the automated service discovery is used to reduce the problem domain and to accommodate human guidance and validation on the discovery.

Building on the previous work, Prof Liang has done some work on the computational and the ontological issues of semi-automated approaches for dynamic service composition. She has focused on particular ways to facilitate dynamic resource re-use and sharing through the design of new technology of service composition. "We try to improve the underlying search mechanism for our composite service discovery algorithm. We hope to improve both the dynamics and applicability in reusing available software and thus promoting the use of complex, composite Web services by the business sectors for e-commerce applications," said Prof Liang. Some of the work has been published in journals such as the Journal of Web Services Research and International Conference of Electronic Commerce (See for example, "Q. Liang, L. N. Chakarapani, S. Su, R. N. Chikkamagalur and H. Lam "A Semi-automatic Approach to Composite Web Services Discovery, Description and Invocation," *International Journal of Web Services Research (IJWSR)*, Vol. 1, No. 4, 64-89, 2004.") ■

[4] W3C Note 15 May 2001

Special Research News

1. 2005 Meeting of Singapore Econometric Study Group (SESG)
9 July 2005

The School of Economics and Social Sciences (SESS) will host the second meeting of the Singapore Econometrics Study Group (SESG) on 9 July 2005. SESG aims to provide a forum for econometricians from within and outside Asia to exchange views on research ideas and developments in econometrics. Professor Peter C.B. Phillips, a Sterling Professor at Yale University and a Visiting Professor at SMU, will deliver an invited lecture during the meeting. More information is available from http://www.sess.smu.edu.sg/SESG/index.htm.

2. SMU EDGE Conference 2005

The Enterprise Development Growth and Expansion Programme [EDGE] at SMU will be organizing its inaugural SMU EDGE Conference at the Orchard Hotel from 11 to 13 July 2005. The theme of the conference is "Bridging the Gap: Entrepreneurship in Theory and Practice".

Entrepreneurship has been identified as a critical factor for competitiveness at the firm and national level. It requires creativity, innovation and opportunity recognition. Entrepreneurs and entrepreneurial managers make a difference in wealth creation. The business environments and public policy influence entrepreneurial activity. There has been considerable research in the field. This conference focuses on entrepreneurship research and the link between theory and practice.

Keynote speakers at the conference include Professor Peter S Ring (Loyola Marymount University) and Alan Carsrud (Florida International University).

The conference has drawn some 159 abstract submissions. It is supported by *Entrepreneurship Theory and Practice, Journal of Enterprising Culture and Venture Capital*. The three journals will select suitable papers for publication in special issues of the journals. *Entrepreneurship Theory and Practice*, a leading entrepreneurship journal, will publish on the theme of "Relationships, Partnerships and Entrepreneurship". The *Journal of Enterprising Culture* will do so under the theme of "Measurement Issues in Entrepreneurship Research" while the Venture Capital on "The Changing Investment Environment". More information on this conference can be found at http://www.research.smu.edu.sg/faculty/edge/

3. The first MSI Asian Marketing Conference

The Lee Kong Chian School of Business, together with the Marketing Science Institute and Australian Graduate School of Management, is organizing the first Marketing Science Institute Asian Marketing Conference which will take place in Singapore on 25 and 26 July 2005. This conference brings together marketing academics to discuss the latest developments with leading industry practitioners from invitation-only participants from Asia's leading marketing companies.

The conference is designed to create a dynamic, interactive environment in which academics and industry practitioners can meet formally and informally to share the latest marketing practices from around the world. It provides a great opportunity to learn from the best in academia and industry. More information can be obtained from http://www.business.smu.edu.sg/MSI/index.htm.

4. 15th Annual Asia-Pacific Futures Research Symposium

The Lee Kong Chian School of Business co-sponsored the 15th Annual Asia-Pacific Futures Research Symposium which was held on 24 and 25 Feb 2005. The other sponsors include Kent State University, Hong Kong Baptist University, The Review of Futures Markets, the Chicago Board of Trade Educational Research Foundation and the Journal of Futures Markets. The Symposium focused on research of derivative securities and markets.

5. Visits by Distinguished Professors:

a) Professor Abdullahi Ahmed An-Na'im of Emory Law School visited SMU on 16-19 February 2005 as the first Presidential Distinguished Lecturer. An internationally recognized scholar of Islam and human rights, and human rights in cross-cultural perspectives, Professor An-Na'im teaches courses in human rights, religion and human rights, Islamic law, and criminal law. His research interests also include constitutionalism in Islamic and African countries, and Islam and politics. During his visit to SMU, he delivered a lecture on "Islam, Human Rights and Secularism".

b) Professor Peter Phillips of the Yale University visited the SESS as Visiting Professor in March/April. He delivered a series of special lectures and gives lectures to the Applied Econometrics classes.

c) SESS hosted a reception for the participants of the NUS Institute of Mathematical Sciences Program "Semi-parametric methods for survival and longitudinal data" on 20 March. Guests included Daniel McFadden, Jerry Hausman, Oliver Linton, Roger Koenker, Ying Zhi Liang, Chen Xiaohong and many others.

d) Other significant visitors and seminar speakers include:
- Dr Neil Ericsson of the Board of Governors, Federal Reserve System
- Professor Adrian Pagan, Australian National University
- Professor Takeshi Amemiya, Stanford University
- Professor Raaj Sah, University of Chicago

6. Assistant Professor Riccardo Pelizzo, SESS, has been appointed Associate Editor (Asia) of Politics and Policy. Politics and Policy is a journal published by The Policy Studies Organisation.

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