3rd NUS Workshop on Risk & Regulation
(R^2 Workshop 2015)
❧ 8 – 9 January 2015 ❧
National University of Singapore, Singapore

Table of Contents

PROGRAMME
Overview | Daily Schedule

PROGRAMME OVERVIEW

Thursday 8 January 2015	Friday 9 January 2015
08:30 – 08:50 Registration	**08:30 – 09:00** Registration
08:50 – 09:00 Opening Address	
09:00 – 09:45 Nizar TOUZI	**09:00 – 09:45** Mihail ZERVOS
09:45 – 10:30 Xuezhong HE	**09:45 – 10:30** Zhongfei LI
10:30 – 11:00 Group Photo & Tea Break	**10:30 – 11:00** Tea Break
11:00 – 11:45 Min DAI	**11:00 – 11:45** Stefan WEBER
11:45 – 12:30 Tim Siu-Tang LEUNG	**11:45 – 12:30** Weimin LIU
12:30 – 14:00 Lunch	**12:30 – 14:00** Lunch
14:00 – 14:45 Yimin YANG	**14:00 – 14:45** Steven KOU
14:45 – 15:30 Ajay JASRA	**14:45 – 15:30** Takanori ADACHI
15:30 – 16:00 Tea Break	**15:30 – 16:00** Tea Break
16:00 – 16:25 Ser-Huang POON	**16:00 – 16:25** Chen YANG
16:25 – 16:50 Yaoting LEI	**16:25 – 16:50** Jing XU
16:50 – 17:15 Cong QIN	**16:50 – 17:15** Yingda SONG
17:15 – 17:40 Anders ERIKSSON	**17:15 – 17:40** Yue LIU
	17:40 – 17:50 Closing Address

Thursday, 8 January 2015			
TIME	**ACTIVITY**	**VENUE**	**REF**
08:30 – 08:50	Registration	--	--
08:50 – 09:00	**Opening Address**	SR1	--
09:00 – 09:45	**Nizar TOUZI** Ecole Polytechnique, France *Model-Free Hedging under Multiple-Marginals Constraint*	SR1	Pg 8
09:45 – 10:30	**Xuezhong HE** University of Technology, Sydney, Australia *Optimal Time Series Momentum*	SR1	Pg 2
10:30 – 11:00	Group Photo & Tea Break	Staff Lounge	--
11:00 – 11:45	**Min DAI** National University of Singapore, Singapore *Portfolio Selection with Capital Gain Taxes*	SR1	Pg 1
11:45 – 12:30	**Tim Siu-Tang LEUNG** Columbia University, United States *Leveraged ETFs: Price Dynamics and Implied Volatility Scaling*	SR1	Pg 4
12:30 – 14:00	Lunch	Staff Lounge	--
14:00 – 14:45	**Yimin YANG** Protiviti Inc., United States *Setting Initial Threshold for Anti-Money Laundering Transaction Monitoring - A Mathematical Framework*	SR1	Pg10
14:45 – 15:30	**Ajay JASRA** National University of Singapore, Singapore *A Stable Particle Filter in High-Dimensions*	SR1	Pg 3
15:30 – 16:00	Tea Break	Staff Lounge	--
16:00 – 16:25	**Ser-Huang POON** The University of Manchester, United Kingdom *Approximation of Incremental Economic Capital*	SR1	Pg 6
16:25 – 16:50	**Yaoting LEI** National University of Singapore, Singapore *Costly Arbitrage through Pairs Trading: The Case of China*	SR1	Pg 4
16:50 – 17:15	**Cong QIN** National University of Singapore, Singapore *A New Type of Free Boundary Problem Arising From A Partial Exercise Model Of Executive Stock Options (ESOs)*	SR1	Pg 7

* Staff Lounge is located beside Seminar Room 1 (SR1).

THU

Thursday, 8 January 2015			
TIME	ACTIVITY	VENUE	REF
17:15 – 17:40	**Anders ERIKSSON** Standard Chartered Bank, Singapore *Backtesting ES using a Counting Process*	SR1	Pg 2

Friday, 9 January 2015			
TIME	**ACTIVITY**	**VENUE**	**REF**
08:30 – 09:00	Registration	--	--
09:00 – 09:45	**Mihail ZERVOS** London School of Economics, United Kingdom *Agency, Firm Growth and Managerial Turnover*	SR1	Pg10
09:45 – 10:30	**Zhongfei LI** Sun Yat-sen University, China *Optimal Dividend Strategy for a Diffusion Model with Time-Inconsistent Preferences*	SR1	Pg 5
10:30 – 11:00	Tea Break	Staff Lounge	--
11:00 – 11:45	**Stefan WEBER** Leibniz Universität Hannover, Germany *Measures of Systemic Risk*	SR1	Pg 8
11:45 – 12:30	**Weimin LIU** The University of Nottingham, China *Liquidity Risk and Asset Pricing: Evidence from US Daily Data, 1926–2010*	SR1	Pg 5
12:30 – 14:00	Lunch	Staff Lounge	--
14:00 – 14:45	**Steven KOU** National University of Singapore, Singapore *Information from Options during the Crisis: An Empirical Likelihood Method of Combining Stock and Option Prices*	SR1	Pg 3
14:45 – 15:30	**Takanori ADACHI** Ritsumeikan University, Japan *Toward Categorical Risk Measure Theory*	SR1	Pg 1
15:30 – 16:00	Tea Break	Staff Lounge	--
16:00 – 16:25	**Chen YANG** National University of Singapore, Singapore *The Level of Risk-free Rate in China: Evidences from the Classification Fund Market*	SR1	Pg 9
16:25 – 16:50	**Jing XU** National University of Singapore, Singapore *Random Level Shifts in the U.S. Short-term Yields*	SR1	Pg 9
16:50 – 17:15	**Yingda SONG** National University of Singapore, Singapore *A General Framework for Pricing Asian Options under Markov Processes*	SR1	Pg 7

* Staff Lounge is located beside Seminar Room 1 (SR1).

Friday, 9 January 2015			
TIME	**ACTIVITY**	**VENUE**	**REF**
17:15 – 17:40	**Yue LIU** Nanyang Technological University, Singapore *Sensitivity Analysis and Integration by Parts for Markov Chains*	SR1	Pg 6
17:40 – 17:50	**Closing Address**	SR1	--

ABSTRACTS

Toward Categorical Risk Measure Theory
Takanori ADACHI, Ritsumeikan University, Japan

We introduce a category that represents varying risk as well as ambiguity. We give a generalized conditional expectation as a presheaf for this category, which not only works as a traditional conditional expectation given a σ-field but also is compatible with change of measure. Then, we reformulate dynamic monetary value measures as a presheaf for the category. We show how some axioms of dynamic monetary value measures in the classical setting are deduced as theorems in the new formulation, which is evidence that the axioms are correct. Finally, we point out the possibility of giving a theoretical criteria with which we can pick up appropriate sets of axioms required for monetary value measures to be good, using a topology-as-axioms paradigm.

Portfolio Selection with Capital Gain Taxes
Min DAI, National University of Singapore, Singapore

We consider the continuous-time portfolio selection problem with capital gain taxes. Since closed-form solutions are generally unavailable, we provide asymptotic expansions with capital gain taxes, interest rate, and other parameters, and show that the expansion order is 4/3 for capital gain taxes. This is in contrast to the well-known expansion order of 2/3 for transaction costs. Moreover, we obtain an explicit investment and consumption strategy that effectively approximates the optimal strategy. In addition, we find that the optimal tax-deflated fraction of initial wealth in the risky asset is higher than the "Merton line".

This is a joint work with Jiatu CAI and Xinfu CHEN.

Backtesting ES using a Counting Process
Anders ERIKSSON, Standard Chartered Bank, Singapore

Backtesting Expected Shortfall; an industry perspective:
One of the many changes to the regulatory landscape for the financial industry is the replacement of Value at Risk in favour for Expected Shortfall as a risk measure. A still open question is how risk models based on Expected Shortfall would be back-tested. This talk presents a number of approaches to back-test an Expected Shortfall model that is currently being considered by the Industry; in particular we consider an approach using exceptions counting. We also perform a power study of the different approaches considered.

Optimal Time Series Momentum
Xuezhong HE, University of Technology, Sydney, Australia

We develop a continuous-time asset price model to capture the time series momentum documented recently. The underlying stochastic delay differential system facilitates the analysis of effects of different time horizons used by momentum trading. By studying an optimal asset allocation problem, we find that the performance of time series momentum strategy can be significantly improved by combining with market fundamentals and timing opportunity with respect to market trend and volatility. Furthermore, the results also hold for different time horizons, the out-of-sample tests and with short-sale constraints. The outperformance of the optimal strategy is immune to market states, investor sentiment and market volatility.

Authors: Xue-Zhong HE and Kai LI, University of Technology, Sydney, Australia; Youwei LI, Queen's University Belfast, UK.

Key words: Momentum, reversal, portfolio choice, optimality, profitability.

JEL Classification: G12, G14, E32

A Stable Particle Filter in High-Dimensions
Ajay JASRA, National University of Singapore, Singapore

We consider the filtering problem in high-dimension, that is, when the hidden state lies in dimension d, with d large. This problem is ubiquitous in financial problems, for instance, in the online estimate of volatility. This is a notoriously difficult problem as required exact numerical procedures, such as particle filters, can have a cost that is exponential in d, for the algorithm to be stable in some sense. We develop a new particle filter for a specific class of state-space models in discrete-time. This new class of particle filters provides correct Monte Carlo estimates for any fixed d, as do standard particle filters. However, under an i.i.d. structure, we show that in order to achieve some stability properties, this new filter has cost $O(nNd^2)$, where n is the time parameter and N is the number of Monte Carlo samples, that are fixed, independent of d. This suggests that it is possible to tackle some high-dimensional filtering problems using exact Monte Carlo methods that were not previously possible to do so.

Information from Options during the Crisis: An Empirical Likelihood Method of Combining Stock and Option Prices
Steven KOU, National University of Singapore, Singapore

As discussed in the finance literature (Lo and Wang, 1995, J. of Finance; Ross, 2014, Journal of Finance; Hansen and Scheinkman, 2014, Working Paper), option prices may contain information about the dynamics of the underlying asset returns including the drift. This conclusion appears to be surprising because, according to the Black-Scholes formula, only volatility of returns is used in the option pricing formula. In this paper, we confirm this viewpoint by showing that the option information leads to shorter confidence intervals for the parameters of the returns dynamics (e.g. drift, volatility and jump parameters) and more efficient ways to reflect current market information, which is especially useful during financial crises. Our approach is through developing an empirical likelihood based method that can combine the return series and the associated derivative prices for the purpose of estimation. We apply the new method to Standard and Poor's 500 Index and its derivative prices. Our empirical findings suggest that inclusion of option price data provides a more seasonable set of estimates that can reflect the market conditions during the 2009 financial crisis. We also provide theoretical justification by establishing large sample properties of resulting estimators under suitable regularity conditions.

This is a joint work with Tony SIT and Zhiliang YING.

Costly Arbitrage through Pairs Trading: The Case of China
Yaoting LEI, National University of Singapore, Singapore

We study the optimal trading policy of an arbitrageur who invests in a market with arbitrage opportunities. In particular, we consider the existence of two cointegrated assets. The arbitrageur can exploit temporary mispricing in these two assets by simultaneously buying the relatively underpriced asset and selling short the relatively overpriced one. We build on the model of Liu and Timmermann (2013) and include transaction costs, which imposes additional limits to the implementation of such convergence trade strategy. We show that the presence of transaction costs could reveal an endogenous stop-loss concern, which affects the optimal policy of the fund manager in significant ways. Using pairs of Chinese shares that are dual-listed in Shanghai and in Hong Kong, we show that our cointegration strategy is generally superior to the relative-value pairs trading strategy studied in Gatev, Goetzmann, and Rouwenhorst (2006).

Leveraged ETFs: Price Dynamics and Implied Volatility Scaling
Tim Siu-Tang LEUNG, Columbia University, United States

The growth of the exchange-traded fund (ETF) industry has given rise to the trading of leveraged ETFs (LETFs) and options written on these funds. We first illustrate how the price dynamics of LETFs depend on the realized variance of their reference index, as well as the leverage ratio. Furthermore, we model the LETF implied volatility surfaces under a general stochastic volatility framework to capture the salient features of the empirical IV patterns. Analytic approximations for prices and implied volatilities are derived for LETF options, along with rigorous error bounds. In these price and IV expressions, we can explicitly identify their non-trivial dependence on the leverage ratio. Moreover, we introduce a "moneyness scaling" procedure for comparing implied volatilities across leverage ratios, and demonstrate this using empirical price data.

Optimal Dividend Strategy for a Diffusion Model with Time-Inconsistent Preferences
Zhongfei LI, Sun Yat-sen University, China

In this talk we consider the optimal dividend problem in the presence of time-inconsistent preferences. Suppose that the company's surplus follows a general diffusion process, managers' preferences are depicted by the quasi-hyperbolic discount function, and the objective is to maximize the cumulative present value of dividend payments until ruin. Depending on the manager's forecast about her future selves' preferences, we consider the optimal dividend problem for a naive manager and a sophisticated manager. Firstly, we derive the Hamilton-Jacobi-Bellman (HJB) equations and verification theorems for the two managers' problems by using the stochastic optimal control approach. Then, when the uncontrolled surplus process is a Brownian motion with drift, we derive the explicit expressions of optimal dividend strategies and optimal value functions for the two managers, and present some sensitivity analysis of the optimal dividend strategies. Our results show that when the uncontrolled surplus process is a Brownian motion with drift, managers with time-inconsistent preferences tend to pay out dividend earlier than their time-consistent counterpart, the sophisticated manager is more inclined to pay out dividends than the naive manager, and with proper punishments on the naive manager and the sophisticated managers, the two managers' strategies can coincide with that of the time-consistent manager.

Authors: Zhongfei LI and Yan ZENG, Sun Yat-sen University, China; Shumin CHEN, Guangdong University of Technology, China.

Liquidity Risk and Asset Pricing: Evidence from US Daily Data, 1926–2010
Weimin LIU, The University of Nottingham, China

This paper presents a detailed analysis of liquidity risk using data from 1926 to 2010. Among the eight liquidity measures examined, the trading discontinuity proxy and turnover tend to perform best. Compared with the size and value premia, the liquidity premium is more significant and robust. Accordingly, the liquidity-augmented CAPM provides a good description of expected returns in comparison with five commonly used (or likely to be used) models. The paper also distinguishes liquidity risk from liquidity level and shows that the latter lacks significant predictive power beyond liquidity risk.

Sensitivity Analysis and Integration by Parts for Markov Chains
Yue LIU, Nanyang Technological University, Singapore

We establish an integration by parts formula for the random functionals of a continuous-time Markov chain, based on partial differentiation with respect to jump times, while leaving the discrete-time embedded chain unchanged. As an application we compute sensitivities (Greeks) that are useful for risk management in asset price models with Markovian regime switching. In comparison with classical approaches based on the partial Malliavin calculus for Brownian motion, our method has a wider scope of application by taking both sources of Markovian and Gaussian noises into account. We also improve on some recent results in the literature on integration by parts for Markov chains.

This is a joint work by Yue LIU and Nicolas PRIVAULT.

Approximation of Incremental Economic Capital
Ser-Huang POON, The University of Manchester, United Kingdom

Incremental economic capital (IECap) and economic capital (ECap) contributions are important in assessing the risk price of a new loan and the distribution of the credit risk in the portfolio. Simulation of these can be computationally expensive and unstable, but it appears that closed form approximations provide relatively accurate, consistent and quick solutions in many cases. The formula considered here is based on multi-factor approximation from Pykhtin (2004). The formula takes amortization plans, maturities, credit migrations and correlations between obligors into account and it allows for approximation of all ECap contributions without extra computational cost. Furthermore, after the ECap of the original portfolio is computed, the incremental economic capital can be computed within few seconds and more accurately than in standard linear approximation based on economic capital contributions. The formula is tested with heterogeneous loan portfolios against Monte Carlo simulations.

This is a joint work with Hua BAI, Axel CLEMENT, Thomas RIBARITS, and Heikki SEPPÄLÄ.

Keywords: Approximation, Economic capital, Economic capital contributions, Incremental economic capital, Risk pricing, Value at risk, Expected shortfall, Granularity adjustment, Multi-factor adjustment

---

A New Type of Free Boundary Problem Arising from a Partial Exercise Model of Executive Stock Options (ESOs)

Cong QIN, National University of Singapore, Singapore

From the study of partial exercise phenomenon by Rogers and Scheinkman(2007), an investment problem of a risk averse executive, whose portfolio comprises a certain amount of ESOs and a riskless bond, can be described as a singular stochastic control problem with regarding the remaining ESOs as the control. Then a corresponding variational inequality can be derived in viscosity sense. This is a four dimensional, fully nonlinear and degenerate PDE of parabolic type with two time like variables. Although, in the case of exponential utility and perpetual ESOs, the problem can be simplified as two-dimensional, it is a new type of free boundary problem in the literature. We establish the existence and uniqueness of the classical solution, and the regularity of the free boundary. In addition, the optimal exercise strategy can be constructed with the help of the free boundary. Also, a verification theorem can be obtained.

This is a joint work with Xinfu CHEN, Xin LAI and Wanghui YU.

A General Framework for Pricing Asian Options under Markov Processes

Yingda SONG, National University of Singapore, Singapore

A general framework is proposed for pricing both continuously and discretely monitored Asian options under one-dimensional Markov processes. For each type (continuously monitored or discretely monitored), we derive the double transform of the Asian option price in terms of the unique bounded solution to a related functional equation. In the special case of continuous-time Markov chain (CTMC), the functional equation reduces to a linear system that can be solved analytically via matrix inversion. Thus the Asian option prices under a one-dimensional Markov process can be obtained by first constructing a CTMC to approximate the targeted Markov process model, and then computing the Asian option prices under the approximate CTMC by numerically inverting the double transforms. Numerical experiments indicate that our pricing method is accurate and fast under popular Markov process models, including the CIR model, the CEV model, Merton's jump diffusion model, the double-exponential jump diffusion model, the variance gamma model, and the CGMY model.

Model-Free Hedging under Multiple-Marginals Constraint
Nizar TOUZI, Ecole Polytechnique, France

We provide solutions to the problems of model-free superhedging of Lookback options and Variance options under finitely many marginals constraints. These solutions correspond to a finitely-many marginals version of the Azema-Yor and the Root solutions of the Skorohod embedding problem. We discuss the limiting full-marginal problem, and we provide some general martingale optimal transport results in this context.

Measures of Systemic Risk
Stefan WEBER, Leibniz Universität Hannover, Germany

Systemic risk refers to the risk that the financial system is susceptible to failures due to the characteristics of the system itself. The tremendous cost of this type of risk requires the design and implementation of tools for the efficient macroprudential regulation of financial institutions. The talk proposes a novel approach to measuring systemic risk.

Key to our construction is the philosophy that there is no distinction between risk and capital requirements, as recently described in Artzner, Delbaen & Koch-Medina (2009). Such an approach is ideal for regulatory purposes. The suggested *systemic risk measures* express systemic risk in terms of capital endowments of the financial firms. These endowments constitute the *eligible assets* of the procedure. *Acceptability* is defined in terms of cash flows to the entire society and specified by a standard acceptance set of an arbitrary scalar risk measure. Random cash flows can be derived conditional on the capital endowments of the firms within a large class of models of financial systems. These may include both *local* and *global interaction*. The resulting systemic risk measures are set-valued and allow a mathematical analysis on the basis of set-valued convex analysis.

We explain the conceptual framework and the definition of systemic risk measures, provide algorithms for their computation, and illustrate their application in numerical case studies – e.g. in the network models of Eisenberg & Noe (2001), Cifuentes, Shin & Ferrucci (2005), and Amini, Filipovic & Minca (2013).

This is a joint work with Zachary G. FEINSTEIN (Washington University in St. Louis) and Birgit RUDLOFF (Princeton University).

Random Level Shifts in the U.S. Short-term Yields
Jing XU, National University of Singapore, Singapore

We propose interest rate models with random level shifts to capture the salient empirical features observed in the U.S. short-term interest rate market in the recent years. We fit the affine yield models with one or two factors to the U.S. Treasury bill yields data from January 2002 to December 2009, and test these fitted models in the out-of-sample period extending from January 2010 to December 2011. We show that the affine yield models with random level shifts almost uniformly outperform their counterparts without random level shifts. In particular, we show that the models with random level shifts produce better time series forecasts and cross-section of T-bill prices.

This is a joint work with Robert L. KIMMEL and Steven KOU.

The Level of Risk-free Rate in China: Evidences from the Classification Fund Market
Chen YANG, National University of Singapore, Singapore

One-month SHIBOR rate, three-month fixed deposit rate, and ten-year treasure yield are often employed as a proxy for the risk-free rate in China's market. However, empirical studies show that these rates are too low to reflect the actual level of risk-free rate demanded by China's market. Using the Black-Scholes option pricing theory, we develop an approach to estimating the level of China's risk-free rate in terms of the classification fund, an innovative structured product that is capable of capturing the characteristics of both the bond market and the equity market. We find that the level of the risk-free rate implied from the classification fund market is uniformly higher than the commonly used risk free rates, which confirms the presence of a downward bias in the level of risk-free rate.

This is a joint work with Min DAI, S. G. KOU, and Zhenfei YE.

Setting Initial Threshold for Anti-Money Laundering Transaction Monitoring - A Mathematical Framework
Yimin YANG, Protiviti Inc., United States

This paper establishes a theoretical framework for setting the initial threshold to monitor financial transactions in Bank's Anti-Money Laundering System. It can incorporate both quantitative and qualitative judgments into the calculation.

Keywords: AML, BSA, Scenario, Threshold Setting, Transaction Monitoring, Convexity.

Agency, Firm Growth and Managerial Turnover
Mihail ZERVOS, London School of Economics, United Kingdom

We consider managerial incentive provision under moral hazard in a firm that is subject to stochastic growth opportunities. In the model that we study, managers are dismissed after poor performance as well as when an opportunity to improve the firm's profitability that requires a change of management arises. The optimal contract may induce managerial entrenchment, whereby, ex post-attractive growth opportunities are foregone after good performance because of contractual commitments. Realized growth depends on the frequency and size of growth opportunities as well as on the severity of moral hazard. The prospect of growth-induced turnover limits the firm's ability to rely on deferred compensation as a disciplinary device. The empirical evidence for the U.S. is broadly supportive of the model's predictions. Firms in industries with better growth prospects have higher C.E.O. turnover and more front-loaded C.E.O. compensation.

INFORMATION
Committee | Logistics | General | Zonal Map

Committee

ORGANIZING COMMITTEE

Min DAI (National University of Singapore, Singapore)

Steven KOU (National University of Singapore, Singapore)

Chao ZHOU (National University of Singapore, Singapore)

Logistics

MEALS

Tea breaks and lunches, served buffet-style at the workshop venue, are catered from a Halal-certified supplier. Usually some of the food items would be suitable for vegetarians.

Dinners are not included. Nevertheless, a wide variety of food at affordable prices (from S$2.00) is available in the non-air-conditioned canteen and air-conditioned cafe near the venue for talks. More canteens, fast food outlets and restaurants are found in other parts of the campus (refer to Zonal Map). Some are less than 10-minutes' walk away from the conference venue while some are accessible by internal shuttle bus. Some stalls may open as early as 7.30am and close as late as 8.00pm. Halal and Vegetarian options are available in all canteens on campus.

INTERNET ACCESS & USE OF COMPUTERS

A computing lab (S17-03-02) will be open for participants' access during the event period. It is located at level 3 of block S17 and consists of 42 desktop units that are internet-ready and installed with Windows 7, standard Microsoft Office applications, SSH, Adobe Reader, MATLAB. Limited WI-FI accounts would also be made available during event period for the convenience of those using personal notebook/laptop.

Operating hours: 8.30am – 6.00pm (Wednesday – Thursday)
                     8.30am – 5.30pm (Friday)

Participants will have to request for account name and password to use either the computer in the computing lab, or for WI-FI access on their own notebook/laptop. Approach the IT support staff for account name and password (subject to availability).

FAX SERVICE

Participants who wish to send faxes may do so at the general office of the Department of Mathematics (level 4, block S17). This service is chargeable at a flat rate of S$0.50 per page.

Operating hours: 8.30am – 6.00pm (Monday – Thursday)
Operating hours: 8.30am – 5.30pm (Friday)

GETTING AROUND NUS

The internal shuttle buses A, B, C, D, and UT-FoS (free-of-charge) serve the Kent Ridge campus.

Bus A1 and A2 cover substantial parts of the campus. A1 stops outside Kent Ridge MRT station, NUH and opposite S17, while A2 stops outside S17, opposite NUH and opposite Kent Ridge MRT station.

Bus A1E and A2E operates during term time on weekdays except public holidays. Bus A1E operates from 7.30am to 9.00am and stops outside Kent Ridge MRT station, and opposite S17. Bus A2E operates from 5.30pm to 7.00pm and stops outside S17, and opposite Kent Ridge MRT station.

Bus B is a loop service that serves Kent Vale and the other part of the campus. It does not stop at or anywhere near S17.

Bus C is a loop service that serves Kent Vale. It stops in front of and opposite S17.

Bus D is a loop service that serves the University Town. Bus D1 does not stop at or anywhere near S17. Bus D2 stops outside Kent Ridge MRT, opposite S17, University Town, outside S17 and opposite Kent Ridge MRT.

Bus UT-FoS is a direct service provided during term time on weekdays except public holiday at 9.40am, 9.50am, 11.40am, 11.50am, 1.40pm, 1.50pm, 3.40pm, and 3.50pm. Bus UT-FoS stops only at University Town and opposite S17.

More details on NUS internal shuttle bus can be found at:
http://www.nus.edu.sg/oed/services/transport/shuttle-bus-services.htm

The public bus SBS95 (fare-based) stops at the same stops as A1 and A2 between S17 and Kent Ridge MRT station. It also stops near and opposite Buona Vista MRT station (which is off-campus).

General

PUBLIC TRANSPORTATION

The public transport network in Singapore consists of bus, MRT (Mass Rapid Transit), LRT (Light Rail Transit) and taxi. Buses and MRTs are the most affordable modes of public transport with standard fares ranging from S$1.00 to S$2.20 (depending on distance). Bus fares are charged on board by tapping a stored-value card or paying the exact fare in Singapore currency to the driver. Bus and MRT fares can be calculated using the Fare Calculator on the Public Transport website (http://www.publictransport.sg), under eservices.

MRT fare is paid by tapping a Stored Value Card or a Standard Ticket at the gantry. The Standard Ticket can be used up to six times within 30 days from the date of purchase. The purchase price includes a deposit of 10 cents which will be automatically returned through an off-set against the passenger's fare on the third trip. A user also enjoys a 10-cent discount on the sixth trip. The Standard Ticket can be purchased at the General Ticketing Machine (GTM) at all MRT and LRT stations. LRTs are only available in selected residential neighbourhoods and operate similarly as MRTs.

Typically, the first bus and train starts running at 5.30am and the last service is 11.30pm daily. Special night bus services with specific routes that charge a flat rate of S$4.50 are available from 11.30pm to 4.35am on Fridays, Saturdays and eves of Public Holidays.

Taxis can be flagged down 24 hours a day on most roads or at taxi-stands outside most major shopping centres and hotels. There is no need to bargain for prices as the taxis are all metered. The basic fare consists of a flag-down fare and a metered fare. The flag-down fare for the first kilometer or less is between S$3.00 and S$5.00, depending on the type of taxi (regular or premium). The metered fare after the first kilometer is based on the distance and waiting times during the journey. Additional charges may also be incurred depending on the time of travel and origin of the journey. A detailed rates guide is posted on the rear door of each taxi for reference.

GETTING TO THE AIRPORT

The easiest way to get to the airport is by taxi. For reference, the journey from NUS with smooth traffic would take about 30 minutes and cost about S$25.00 without surcharge. Surcharges may be incurred depending on time of travel and if the taxi was pre-booked via phone.

To get to the airport by MRT (Mass Rapid Transit), connect to the East-West line (green line) going in the direction of Pasir Ris/Changi Airport. The Changi Airport MRT station is located under Terminals 2 and 3 which are connected to Terminal 1 by sky train. A one-way MRT fare from Kent Ridge station is about S$2.30 (using the Standard Ticket) and takes approximately 57 minutes. More Information on MRT Network Map and fare can be found at: http://www.smrt.com.sg/Trains/NetworkMap.aspx.

FOOD & SHOPPING

Food centres and food courts serving local, Asian and sometimes international cuisine at affordable prices are commonly found in neighbourhoods and shopping malls. There would usually be at least one each of Halal and vegetarian stalls in most establishments. Operating hours of the stalls vary but most of them open by 10am and close by 9pm.

Restaurants and cafes are usually found in shopping malls and bigger neighbourhoods. Operating hours depend on the types of meals served but most would be open between 11.00am and 9.00pm.

Most shopping malls in Singapore operate from 11.00am to 10.00pm every day.

BANK SERVICES & FOREIGN EXCHANGE

Participants may use major credit cards to withdraw cash using the Auto Teller Machines, which can be found in various locations on campus. Alternatively, the local banks offer regular banking services including processing foreign exchange and traveler's cheques. The nearest branches are:

DBS (Holland Village Branch)
    Address: 257 Holland Avenue, Singapore 278984
    Operating hours: 8.30am – 4.30pm (Monday – Friday)
                   8.30am - 1.00pm (Saturday)

DBS/POSB (NUS Remix Branch)
    Address: 31 Lower Kent Ridge Road, #01-02 Yusof Ishak House, Singapore 119078
    Operating hours: 8.30 AM - 4.30 PM (Monday to Friday)
                   8.30 AM - 1.00 PM (Saturday)
Only Personal Banking Services are available. Demand Draft and Remittance services are not available. All cash transactions must be made at Automated Teller Machines.

POSB (Buona Vista Branch)
    Address: Blk 43 Holland Drive #01-59, Singapore 270043
    Operating hours: 8.30am – 4.30pm (Monday – Friday)
                   8.30am - 1.00pm (Saturday)

UOB (Holland Village Branch)
    Address: 211 Holland Avenue, #01-12 Holland Road Shopping Centre, Singapore 278967
    Operating hours: 9.30am – 4.00pm (Monday – Friday)
                   9.00am - 12.30pm (Saturday)

POST OFFICE & POSTAGE STAMPS

Postage stamps can be purchased at the NUS Coop store below Lecture Theatre 27. Other goods and services available at the co-op include books, stationery, sundries and photocopying.

Operating hours (co-op): 9.00am – 6.00pm (Monday – Friday)

A post box is stationed near the bus stop in front of Block S17. The Kent Ridge Post Office at Yusof Ishak House (three bus-stops from LT 27) provides a more comprehensive postal service.

Operating hours: 8.30am – 5.00pm (Monday – Friday)
 8.30am – 1.00pm (Saturday)

USEFUL PHONE NUMBERS

Taxi (for current and advanced booking):

Company	Telephone	Colour of vehicle
CityCab	65521111	Yellow
Comfort Taxi	65521111	Blue
Premier Taxis	63636888	Silver
Prime Taxis	67780808	Copper (regular service); Blue (limousine service)
SMRT Taxis	65558888	White
Trans Cab	65553333	Red
Yellow Top Taxis	62935545	Yellow top with black body

Local Emergency Services for Credit Cards:

American Express	1800-6299-1997
Diner's Club Singapore	64160800(during office hours); 64160900 (after office hours)
MasterCard	800-1100-113
Visa	800-4481-250
JCB	001-800-3865-5486

Others:

Tourist Information	1800-7362000
24-hour Flight Enquiry (Changi Airport)	1800-5424422
Buona Vista Neighbourhood Police Post	1800-7779999
Police Emergency	999
Non-emergency Ambulance	1777
Fire Engine/Ambulance	995

Zonal Map
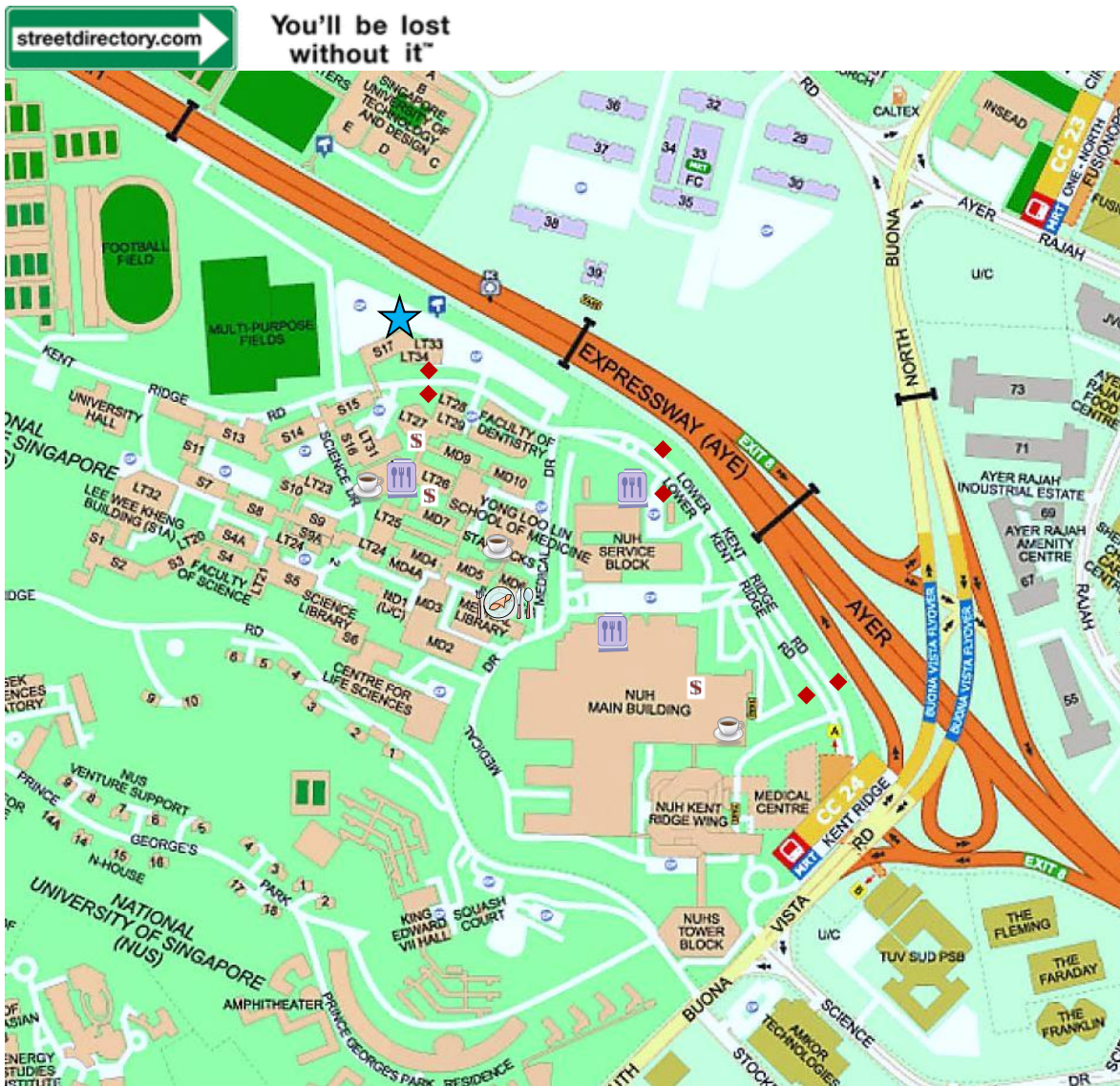
Map powered by Streetdirectory.com

⭐	Workshop venue (S17)
◆	Bus-stop
🍴	Canteen/Food Court
🍽️	Restaurant
☕	Coffee joints (Platypus at Science Canteen; Spinelli at Science canteen; The Coffee Bean at NUH; Starbucks at School of Medicine)
$	Auto Teller Machine