BEHAVIORAL IMPACT OF ALGORITHMIC BOTS AND MARKET DYNAMICS UNDER DIVERSE TRADING MECHANISMS

STATEMENT OF RESEARCH PROJECT

(Algorithmic trading in reality)
In Asia, financial hubs like Singapore, Hong Kong, and Tokyo have invested heavily in infrastructure to support the rise of algorithmic trading. The Singapore Exchange (SGX), for instance, introduced the X-Speed high-performance trading system to provide a low-latency environment tailored to high-frequency traders. Algorithmic trading in Singapore is predicted to grow at a compound annual growth rate of 12.9% between 2024 and 2030, playing a significant role in market activity.

(Challenges of Algorithmic Trading)
Despite benefits like increased liquidity and improved price discovery, algorithmic trading introduces challenges for humans. Algorithm bots, like HFT systems, can exploit their speed advantage to capture stale quotes and engage in latency arbitrage, often at the expense of other market participants. This behavior raises concerns over fairness and stability in financial markets, complicating the regulatory landscape.

These challenges lead to several key questions: How do algorithmic bots influence market performance, including liquidity, volatility, and efficiency? How do traditional traders adjust their behavior when competing against algorithm bots? Finally, how can regulatory bodies, such as the Monetary Authority of Singapore (MAS), balance the benefits of algorithmic trading with the need to maintain market fairness and stability?

(Research objectives)
This research aims to explore the interaction between human behavior and algorithmic bots, focusing on how these bots affect trader behaviors and market dynamics. Specifically, the study will examine the impact of high-frequency trading (HFT), a subset of algorithmic bots, within asset markets. Using experimental methodology, this study will investigate how varying levels of HFT participation influence market behavior.

Additionally, it will evaluate regulatory innovations designed to reduce HFT's speed advantage, such as speed bumps (delays in order execution) and frequent batch auctions (grouping trades at set intervals). These measures aim to level the playing field and mitigate the negative effects of HFT on market dynamics.

The research questions are:
1. How do different proportion of algorithmic bots affect market performance?
2. How do traditional traders adjust their behavior when interacting with algorithmic bots?
3. How do regulatory interventions impact algorithmic bot strategy and market dynamic?

By integrating insights from behavioral finance, experimental economics, and data science, this interdisciplinary study will provide a comprehensive understanding of the role algorithmic bots play in modern financial markets. The findings will be particularly relevant for regions like Singapore, where algorithmic trading forms a crucial part of the financial ecosystem, and robust regulatory oversight is essential to market integrity.

SCOPE OF WORK FOR SELECTED PHD STUDENT

1. Completion Requirements:

To successfully complete the PhD, the student must fulfill several key milestones:

1) Qualifying Exams: Passing the required exams that demonstrate comprehensive knowledge in relevant fields.

2) Progress Reports: Submitting regular reports to track research progress.

3) GAP Hours: Completing 416 hours in the Graduate Assistantship Programme (GAP).

4) PhD Dissertation Defense: Successfully defending their dissertation before a committee.

2. Interdisciplinary Research:
The PhD student's work will focus on interdisciplinary research. Specific tasks include:

5) Literature Review: Reviewing existing research across relevant disciplines to identify gaps and inform the direction of the student's research.

6) Data Collection & Analysis: The student will gather data through experimental simulations and use advanced statistical tools such as Stata for data analysis. The oTree platform will be used for programming and constructing experiments that simulate market behavior.

7) Programming: The student will write and refine code using oTree to design and implement experimental simulations, allowing for precise control of variables and real-time data collection. This data will be analyzed with software like Stata to draw meaningful conclusions.

8) Model Development: Developing both theoretical and empirical models to address key research questions.

9) Co-Authoring Papers: Writing research articles for submission to academic journals, contributing to the existing body of knowledge on algorithmic trading and market behavior.

3. Graduate Assistantship Programme (GAP):
The student will complete 416 hours of assistantship duties, which will provide valuable professional development and experience. These hours will be allocated as follows:

1) Teaching & Laboratory Supervision (up to 100% of GAP hours): Assisting faculty with teaching duties, supervising lab work, or helping to run experiments.

2) Research Assistance (up to 60% of GAP hours): Supporting ongoing research projects that are outside the scope of the student's primary research, contributing to collaborative efforts across the department.

3) Developmental Assignments (up to 20% of GAP hours): Engaging in tasks that support the student's academic and professional growth, such as attending workshops, seminars, or completing specialized training.

4. Collaboration & Coursework:

The PhD student will collaborate with faculty across various disciplines, combining insights from finance, economics, and data science to create innovative research. The student will also be required to complete interdisciplinary coursework to ensure a well-rounded academic foundation. In addition, the student will present research findings at academic conferences, fostering connections with other researchers and receiving feedback to refine their work.