

# POSTGRADUATE SEMINAR SERIES

## Topic Defence Seminar

**Topic Title:** **Efficient Supply Chain Management for Innovative Products: Coordination using combined Sales Rebate and Option contract under Efforts-Dependent Stochastic Demand**

**Presenter:** **Mr. Muhammad Mudassar SHARIF**  
**PhD Student of Computing and Decision Sciences**

**Abstract :** Introducing innovative products is crucial for business growth and success, as they help companies stand out in competitive markets, attract customers, and increase revenue. However, these launches present risks and challenges, such as generating demand and managing inventory in the face of demand uncertainty. Retailer, being closer to the customers, play a crucial role in creating demand for innovative products through their sales efforts, such as hiring sales staff who can educate consumers on the features and benefits of the products. Nevertheless, these efforts can be costly, and retailer might hesitate to allocate resources for promoting these products due to perceived risks. Furthermore, managing inventory for innovative products is also challenging, as demand uncertainty can lead to overstocking or understocking, resulting in financial losses and inefficiencies. These challenges can cause misaligned incentives among supply chain partners, exacerbating coordination issues. To address these challenges, I developed a two-echelon supply chain model based on effort-dependent stochastic demand and conducted two studies.

The first study contributes to the supply chain coordination literature by combining put option with sales rebate and penalty contract. Sales rebate incentivizes retailer to increase sales efforts and order more inventory by providing rebates when sales exceed target levels, thus promoting demand creation and higher sales volume. The penalty approach imposes penalties on the retailer for not meeting sales targets, discouraging understocking and fostering investment in sales efforts, which leads to appropriate inventory levels and improved performance. On the other hand, the Put option enables the retailer to manage the risks associated with demand uncertainty by allowing them to return excess inventory by exercising the put options, managing risks linked to demand uncertainty, and encouraging larger orders while mitigating overstocking risks. This comprehensive approach addresses key challenges such as generating demand for innovative products, managing demand uncertainty, and aligning incentives between supplier and retailer.

The second study aims to coordinate a supply chain facing effort-dependent stochastic demand by merging bidirectional options (Call and Put option) and target sales rebate contracts. Bidirectional options help retailer hedge demand uncertainty with call options for additional inventory if demand is high and put options for returning excess inventory if demand is low. This promotes optimal inventory levels, reduces risk, and fosters collaboration between supplier and retailer by minimizing stockouts and overstock situations.

For both studies, non-linear optimization will be used to determine the optimal decision variables for both the supplier and the retailer in centralized and decentralized settings. By comparing the optimal values of the retailer under decentralized settings with centralized settings, this research aims to analyze the conditions under which the proposed contracts can coordinate the decentralized supply chain. Furthermore, the proposed models will be compared to the non-coordinating wholesale price model (a benchmark case) under identical conditions to identify scenarios where the proposed models outperform the wholesale price contract. Numerical analyses will also be conducted to determine the optimal solutions and profits for the retailer, supplier, and whole supply chain under decentralized, centralized, and proposed contract scenarios with different demand patterns. Additionally, sensitivity analyses will be performed to assess the impact of various non-contracting parameters on the optimal solutions and profits of the retailer, supplier, and overall supply chain.

**Date :** **4 May 2023, Thursday**  
**Time :** **10:00 – 11:30 am**  
**Venue :** **SEK108, 1/F, Simon & Eleanor Kwok Building**  
**Language :** **English**



\*\*\* All are Welcome \*\*\*