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Thought-leadership in Supply Chain Finance and Risk Management

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Quadratic Hedging and Optimization of Option Exercise Policies

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ABSTRACT

Quadratic hedging of option payoffs generates the variance optimal martingale measure. When an option features an exercise policy and its cash flows are hedged according to this approach, it may be tempting to optimize such a policy under this measure. Because the variance optimal martingale measure may not be an equivalent probability measure, focusing on American options we show that the resulting exercise policy may be unappealing. This drawback can sometimes be remedied by imposing time consistency on exercise policies, but in general persists even in this case, which compounds the familiar issue that valuing an option using this measure may not result in an arbitrage free value. An alternative and known approach bypasses both of these pitfalls by optimizing option exercise policies under any given equivalent martingale measure and anchoring quadratic hedging to the resulting value of this policy. Additional research may

assess on realistic applications the magnitude of the limitations associated with optimizing option exercise policies based on the variance optimal martingale measure.

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Operations Revenue Insurance

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ABSTRACT

We propose a new framework for the optimal design of a financial instrument to hedge nonclaimable (e.g., background, operational, and nontradable) risk embedded by business and operating revenues. Our method leverages the ability of financial markets to securitize nonfinancial assets and contingent claims written on the related notes. A new array of integrated operational and financial risk management policies is identified and an explicit solution is provided for a class of project allocation decisions.

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Crowdfunding Adoption in the Presence of Word-of-Mouth Communication

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ABSTRACT

In the fast growing markets of crowdfunding, firms launch projects not only to raise funding directly from the crowd to cover early stage investment, but also to expand product awareness via word-of-mouth (WoM) communication. In this monograph, we investigate a firm's optimal funding choice when launching an innovative product in the market with WoM communication. We characterize the firm's optimal quality and pricing strategies under both crowdfunding and traditional bank financing, and compare these two funding choices and their corresponding welfare implications. Among other results, we show that crowdfunding is a preferable funding choice for a project when (its success probability is below an adoption threshold). More active WoM communication always benefits the firm and favors crowdfunding

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adoption. However, product quality may either increase or decrease as WoM expands. Consumer surplus and social welfare always increase as WoM communication becomes more active.

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Data Sharing in Innovations

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ABSTRACT

Many innovations today are data-driven, ranging from self-driving cars to advanced medical diagnostic tools. The success of data-driven products critically depends on their access to big data. To improve the algorithms of these products, firms make substantial investments in data collection. However, for an individual firm, the accumulation of useful data can be slow, limiting the benefits of the algorithms. Therefore, a key challenge facing governments and policymakers is how to promote data sharing among individual firms. In this monograph, we first discuss unique challenges of data collection and data sharing in innovations, using the autonomous vehicle industry as an example. Then we present findings based on one of our recent research studies that seeks to understand the efficacy of a recent data sharing initiative.

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Coordination Problems in Platform Markets Under Uncertainty

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ABSTRACT

This monograph presents a stylized model of dynamic coordination problem under uncertainty, which is a common issue in platform markets. We consider a scenario where developers make risky investments in developing a complementary good. The optimal decisions of consumers and developers are intertwined and depend on the expectations regarding the other side's behavior. Consumers joining the platform before the full development of the complementary good obtain the basic utility as well as real options to benefit from possible future improvements. The platform owner influences the outcome of the coordination problem through its price policy that trades off between building an earlier consumer base versus extracting profits from early adopters. When the cost of developing the complementary good is small, a price-skimming policy is optimal. Interestingly, price-skimming remains optimal when the cost is high as long as the value of the complementary good is either small or relatively high.

For intermediate values, however, the platform adopts a price-penetration policy.[1]

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[1]This section is a summary version of Ghoddusi *et al.* (2021).

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Value Games

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ABSTRACT

Large literatures in operations and economics analyze dynamic models of profit-optimizing firms. The insights and algorithms in these literatures can be adapted to maximize value if the model ignores external strategic interactions and any risk of bankruptcy. The insertion of external strategic interactions in such a model converts it to a sequential game. This work shows that the resulting sequential games are analogous to dynamic optimization models of the firm in the following sense. Insights and algorithms based on sequential games with a profit criterion and negligible bankruptcy risk can be adapted to their value-criterion counterparts. The illustrations in this work are a model of the palm oil supply chain in Indonesia and a dynamic oligopoly in which inventories affect competition between firms.

Keywords: value; profit; sequential game; Nash equilibria.

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