Ito Integration and Calculus, Concept and Didactical Simulations

Marco Pasciullo

2094810

1. **INTRODUCTION**

The advent of Ito Integration has revolutionized the field of stochastic calculus, providing a powerful tool to analyze and model random processes. This thesis navigates through the foundational concepts of Ito Integration and its integration with traditional calculus. By understanding the underlying principles, we can bridge the gap between deterministic and stochastic calculus, opening doors to a broader spectrum of mathematical applications.

1. **CONCEPTUAL FRAMEWORK**

This section dissects the core concepts of Ito Integration, highlighting its distinguishing features from traditional calculus. The stochastic differential equation, Ito’s lemma, and the rules governing Ito Integration are scrutinized to establish a solid foundation. Special emphasis is placed on comprehending the probabilistic nature inherent in stochastic calculus.

**2.1) Integration with Traditional Calculus**

Building upon the conceptual foundation, this segment explores the seamless integration of Ito’s calculus with traditional calculus. We investigate how stochastic processes and random variables can be incorporated into standard calculus models, offering a more comprehensive framework for modeling real-world phenomena where randomness plays a significant role.

**2.2) Didactical Simulations**

Recognizing the challenges students often face in grasping the complexities of Ito Integration, this thesis introduces innovative didactical simulations. These simulations leverage interactive visualizations and real-world scenarios to provide a hands-on approach to learning. By actively engaging with the material, students can deepen their understanding and develop an intuitive grasp of Ito Integration concepts.

1. **CONCLUSION**

In conclusion, this thesis provides a comprehensive exploration of Ito Integration and its integration with traditional calculus. By elucidating the conceptual intricacies and introducing didactical simulations, we aim to facilitate a more accessible and engaging learning experience for students grappling with these advanced mathematical concepts. This study not only contributes to the academic discourse surrounding stochastic calculus but also seeks to empower educators with effective tools for teaching these complex topics.