Extremal Graph Theory - Financial Risk Assessment

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Abstract

Summarizing your report in a short paragraph. Hello World!

Contents

1 Introduction

1.1 Brief History

Introdfuce the evolution of graph theory applications in financial markets.

1.2 Motivation

Discuss why modern porfolio theory benefits from advanced mathematical tools such as combinatorics and graph theory.

1.3 Interest

Explain why this interection of fiance and combinatorics is crucial for risk management and investment strategies.

2 Portfolio Optimization

Optimization and Diversification Extremal Graph Theory

- Theoretical Framework: Explain the extremal graph theorem.
- Application: Demonstrate how this theorem can predict the maximum or minimum number of edges under certain conditions, which translates to understanding the limits of diversification in a portfolio.
- Examples: Provide hypothetical examples of portfolios and how the theorem applies.

3 Risk Assessment

Coloring algorithms for risk assesment and management

- Concept Introduction: Explain what graph coloring is and the significance of using different colors.
- Implementation: How coloring can be used to represent different levels of risk or different asset classes.
- Practical Example: A case study where coloring helps in decision-making about asset allocation or identifying over-concentrated sectors

4 Holding Vizualization

Correlation Graphs for Portfolio Holdings

- Graph Construction: Discuss how to build a graph where vertices represent assets and edges represent correlations between returns.
- Analysis Techniques: Use threshold levels to add/remove edges or use weights to show the strength of correlations.
- Visualization: Include a section on how these graphs can visually represent portfolio diversification and the interconnections between assets.

5 Conclusion

- Summary: Recap how graph theory enhances portfolio management.
- Future Directions: Suggest how further research could integrate other combinatorial techniques or advanced graph theory concepts.
- Open Problems: Pose any unresolved questions or potential for new research that your paper hints at.

References

[ANHF11] M. J. Ablowitz, S. D. Nixon, T. P. Horikis, and D. J. Frantzeskakis, *Perturbations of dark solitons*, Proc. R. Soc. A Vol **467** (2011), 2597-2621.

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