UNIVERSITÀ
DI TORINO

UNIVERSITÀ DEGLI STUDI DI TORINO

Master's Degree in Quantitative Finance and Insurance

Very Long Thesis Title

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Academic Year 202X/202Y

Abstract

The abstract should be double-spaced and approximately 100 words long.

Contents

List of Figures

List of Tables

Listings

Introduction

This template has been prepared according to the general guidelines that professors usually require at the ESOMAS Department. Before using it, make sure to check the official university regulations and any specific instructions from your supervisors.

Chapter 1

Title of Chapter 1

In this part of the chapter, you should introduce the topic that will be covered. Each chapter introduction should include: ***(i)*** a presentation of the topic, including comments on the methodology used and references to related but unaddressed issues; ***(ii)*** a brief overview of the chapter's structure and development.

Example: This chapter illustrates how to structure a thesis. It begins by introducing sections, proceeds with subsections, and concludes with paragraphs.

1.1 Section

This is a section.

1.1.1 Subsection

This is a subsection.

Paragraph This is a paragraph. You do not need to explicitly use the `\paragraph{}` command; just write plain text.

At the end of each chapter, briefly summarize its main results and findings.[1]

Example: In summary, this chapter discusses how to structure a thesis.

[1] This is a footnote.

Chapter 2

Title of Chapter 2

This chapter demonstrates how to include mathematical formulae, theorems, tables, figures, and diagrams.

2.1 Mathematical Formulae

$$f(x) = \frac{\int_0^\infty 3x \, dx - \sum_{i=0}^{n} i^2}{\sigma \cdot \phi} \tag{2.1}$$

Theorem 2.1 (Famous) *Theorem statement goes here.*

Corollary 2.2 *A corollary that follows from a previous theorem.*

Lemma 2.3 *Lemma.*

Definition 2.1 *A formal definition.*

2.2 Figures, Tables, and Diagrams

This section shows how to include figures, tables, and TikZ diagrams.

2.2.1 Figures

Figure 2.1: University of Turin Logo

2.2.2 Tables

	Column 1	Column 2
Row 1	10	20
Row 2	30	40

Table 2.1: Example of a Basic 2×3 Table

2.2.3 Diagrams

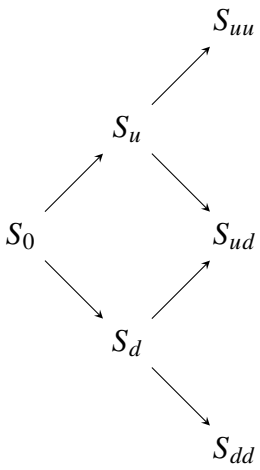

Figure 2.2: Basic Binomial Tree for Option Pricing

2.2.4 References

The Journal of Finance–style references:

- Figure 2.1
- Table 2.1
- Equation (2.1) (With brackets!)
- Chapter 2
- Theorem 2.1
- Appendix A
- Citations: (Hull 2018); Modigliani and Miller 1958; (Grossman and Hart 1982); Ang and Bekaert 1998; (Ongena and Smith 1998); Lowenstein 1997.

Conclusions

References

Ang, Andrew and Bekaert, Geert, 1998, Regime Switches in Interest Rates, NBER Working Paper 6508.

Grossman, Sanford and Hart, Oliver, 1982, Corporate Financial Structure and Managerial Incentives, in *The Economics of Information and Uncertainty*, 107–140.

Hull, John C., 2018, *Options, Futures, and Other Derivatives*, (Pearson).

Lowenstein, Roger, 1997, Street's Incredible Unshrinking Spread, *Wall Street Journal*, Apr. 10, 1997, C1.

Modigliani, Franco and Miller, Merton H., 1958, The Cost of Capital, Corporation Finance and the Theory of Investment, *American Economic Review* 48, 261–297.

Ongena, Steven and Smith, David C., 1998, *What Determines the Number of Bank Relationships? Cross-Country Evidence*, Unpublished manuscript, Norwegian School of Management.

Appendix A

Algorithm

Algorithm 1 Convert Flat Index to Multi-Dimensional Subscripts (ind2sub)

Input: shape vector $\mathbf{s} = (s_1, s_2, \ldots, s_n)$, flat index idx
Output: subscripts vector $\mathbf{sub} = (sub_1, sub_2, \ldots, sub_n)$
for $i = n$ down to 1 **do**
    $sub_i \leftarrow idx \bmod s_i$
    $idx \leftarrow \lfloor idx / s_i \rfloor$
end for
return sub

Appendix B

Code

```python
import numpy as np
# Convert a flat index to multi-dimensional indices
def ind2sub(shape, index):
    subs = []
    for dim in reversed(shape):
        index, remainder = divmod(index, dim)
        subs.insert(0, remainder)
    return tuple(subs)
```

Listing B.1: Python Example

```c
#include <stdio.h>
void ind2sub(const int *shape, int ndims, int index, int *subs) {
    for (int i = ndims - 1; i >= 0; i--) {
        subs[i] = index % shape[i];
        index /= shape[i];
    }
}
int main() {
    ...
    return 0;
}
```

Listing B.2: C Example