



School of Business and Management

Master's Degree in Strategic Finance and Business Analytics

Master's Thesis

Title of the thesis

Sami Kohvakka, 2019

Supervisor: Eero Pätäri D.Sc. (Econ.)

2nd examiner: Some Examiner D.Sc. (Econ.)

ABSTRACT

Author: Sami Kohvakka
Title: Title of the thesis
Year: 2019
Faculty: School of Business and Management
Major: Strategic Finance and Business Analytics
Master's Thesis: Lappeenranta University of Technology
16 pages, 3 figures, 1 table, and 2 appendices.
Examiners: Professor Eero Pätäri
Research Fellow N.N.
Keywords: pairs trading, stock markets

This is my abstract.

TIIVISTELMÄ

Tekijä:	Sami Kohvakka
Otsikko:	Tutkielman otsikko suomeksi
Vuosi:	2019
Tiedekunta:	School of Business and Management
Pääaine:	Strateginen rahoitus ja liiketoiminta-analytiikka
Pro gradu -tutkielma:	Lappeenrannan teknillinen yliopisto 16 sivua, 3 kuvaa, 1 taulukko ja 2 liitettä.
Tarkastajat:	Professori Eero Pätäri Tutkijaopettaja N.N.
Hakusanat:	parikaupankäynti

Tämä on tiivistelmä.

PREFACE

I wish to thank my supervisor

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

Finally, thank you to

Lappeenranta, October 3, 2019

Sami Kohvakka

CONTENTS

1	Introduction	9
1.1	Background	9
1.2	Objectives and Restrictions	9
1.3	Theoretical background	9
1.4	Structure of the Thesis	9
2	Literature review	10
3	Methodology and Data	11
3.1	Data	11
3.2	Methodology	11
4	Discussion	12
4.1	Future Work	12
5	Conclusions	13
	REFERENCES	14
	APPENDICES	
	Appendix 1: How to add appendices	
	Appendix 2: Python sample	

List of Figures

1	LUT logo	13
---	--------------------	----

List of Tables

1	Table header	11
---	------------------------	----

ABBREVIATIONS AND SYMBOLS

CAPM Capital Asset Pricing Model

B&S Black & Scholes

1 Introduction

1.1 Background

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non

1.2 Objectives and Restrictions

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non

1.3 Theoretical background

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non

1.4 Structure of the Thesis

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non

2 Literature review

Focardi, Fabozzi, and Mitov 2016 inserts citation and adds it to bibliography.

According to Huck and Afawubo 2015 pairs trading strategies can be grouped to three categories:

- The minimum distance approaches
- Multi-Criteria Decision Methods
- The modelling of mean reversion

Another way to cite using biblatex is (Huck 2010).

L^AT_EX is great for formulas too - this is an inline formula: $\mathbf{y} = X\beta + \epsilon$

And this is an equation:

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f) \tag{1}$$

3 Methodology and Data

3.1 Data

Historical Finnish stock prices were fetched from Nasdaq Nordic database. Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non

3.2 Methodology

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non

Some random table from wikibooks

Table 1. Table header

Team	P	W	D	L	F	A	Pts
Manchester United	6	4	0	2	10	5	12
Celtic	6	3	0	3	8	9	9
Benfica	6	2	1	3	7	8	7
FC Copenhagen	6	2	1	3	5	8	7

4 Discussion

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non

4.1 Future Work

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non

5 Conclusions

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non

This is a sample image (the one from cover page). Notice that the caption is inserted to the list of figures automatically.



Figure 1. LUT logo

REFERENCES

- Focardi, Sergio M., Frank J. Fabozzi, and Ivan K. Mitov (Apr. 1, 2016). "A New Approach to Statistical Arbitrage: Strategies Based on Dynamic Factor Models of Prices and Their Performance". In: *Journal of Banking & Finance* 65, pp. 134–155. ISSN: 0378-4266. DOI: 10.1016/j.jbankfin.2015.10.005. URL: <http://www.sciencedirect.com/science/article/pii/S0378426615002824> (visited on 02/10/2019).
- Huck, Nicolas (Dec. 16, 2010). "Pairs Trading and Outranking: The Multi-Step-Ahead Forecasting Case". In: *European Journal of Operational Research* 207.3, pp. 1702–1716. ISSN: 0377-2217. DOI: 10.1016/j.ejor.2010.06.043. URL: <http://www.sciencedirect.com/science/article/pii/S0377221710004820> (visited on 02/10/2019).
- Huck, Nicolas and Komivi Afawubo (2015). "Pairs Trading and Selection Methods: Is Cointegration Superior?" In: *Applied Economics* 47.6, pp. 599–613.

Appendix 1. How to add appendices

Write your text or add your images between `\section` and `\sectionend`.

Appendix 2. Python sample

```
1 import numpy as np
2 def fun(param):
3     return param
4
5 fun("hello")
```