# Svetunkov & Svetunkov. Complex-valued Econometrics. Abstracts for chapters

## Chapter 1: Introduction to the Theory of Complex Variables

Chapter 1 serves as a foundational introduction to the theory of complex variables, setting the stage for their application in econometrics. It begins with a historical overview of complex numbers, elucidating their development and conceptual underpinnings. The chapter then progresses to define and explain the properties of complex numbers, complex random variables, and the construction of complex-valued models. By discussing the theoretical aspects of complex variables, including their statistical implications, the chapter prepares readers to understand and leverage complex-valued approaches in econometric modelling. This groundwork is essential for the exploration of complex linear regression and correlation analysis in subsequent chapters.

## Chapter 2: Simple Complex Linear Regression

This chapter introduces the concept of Simple Complex Linear Regression (cLR), which extends traditional linear regression into the complex number domain. It explores how complex numbers, with both real and imaginary components, can be used to model relationships between variables in a more nuanced way than real numbers alone. Key to this chapter is the detailed formulation of the model, estimation techniques, and the unique characteristics of estimators in the complex-valued setting.

## Chapter 3: Correlation Analysis of Complex Random Variables

Chapter 3 delves into correlation analysis using complex random variables. It discusses how to visualize and compute correlations between complex-valued data, a process complicated by the multidimensional nature of such variables. The chapter emphasizes different types of correlation coefficients: conjugate, direct, and Pearson's – and how these relate to complex data analysis. It also introduces the complex correlation matrix, enhancing understanding of inter-variable relationships in complex-valued data sets.

## Chapter 4: Multiple Complex Linear Regression

This chapter expands the discussion from Chapter 3 to Multiple Complex Linear Regression (cLR), focusing on the relationships among multiple complex variables. It lays out the model formulation, estimation process, and inference methods, emphasizing the complexities and challenges unique to handling multiple complex variables. The chapter aims to provide a comprehensive framework for understanding and applying multiple cLR in practical scenarios, including how to address uncertainty and incorporate dummy variables effectively.

## Chapter 5: Assumptions of Complex Linear Models

In Chapter 5, the focus shifts to the assumptions underlying complex linear models. It critically examines the assumptions of model specification, error characteristics, and the implications when these assumptions are violated. This analysis is crucial for effectively applying complex linear models in practice, ensuring robust and reliable results.

## Chapter 6: Complex Dynamic Models

The sixth chapter discusses the application of complex-valued models to time-series data, introducing complex dynamic models such as complex ARIMA. It explains how these models can capture time-dependent structures in complex systems more effectively than their real-valued counterparts. The chapter also briefly compares complex dynamic models to traditional vector autoregressive models, highlighting their advantages and limitations.

## Chapter 7: Examples of Application

Finally, Chapter 7 showcases practical applications of complex-valued models through detailed case studies. It covers how these models are applied to problems like sales forecasting and policy efficiency analysis, providing real-world relevance to the theoretical discussions in previous chapters. This chapter serves to bridge the gap between complex econometric theory and practical application, demonstrating the utility of complex-valued econometrics in addressing diverse analytical challenges.