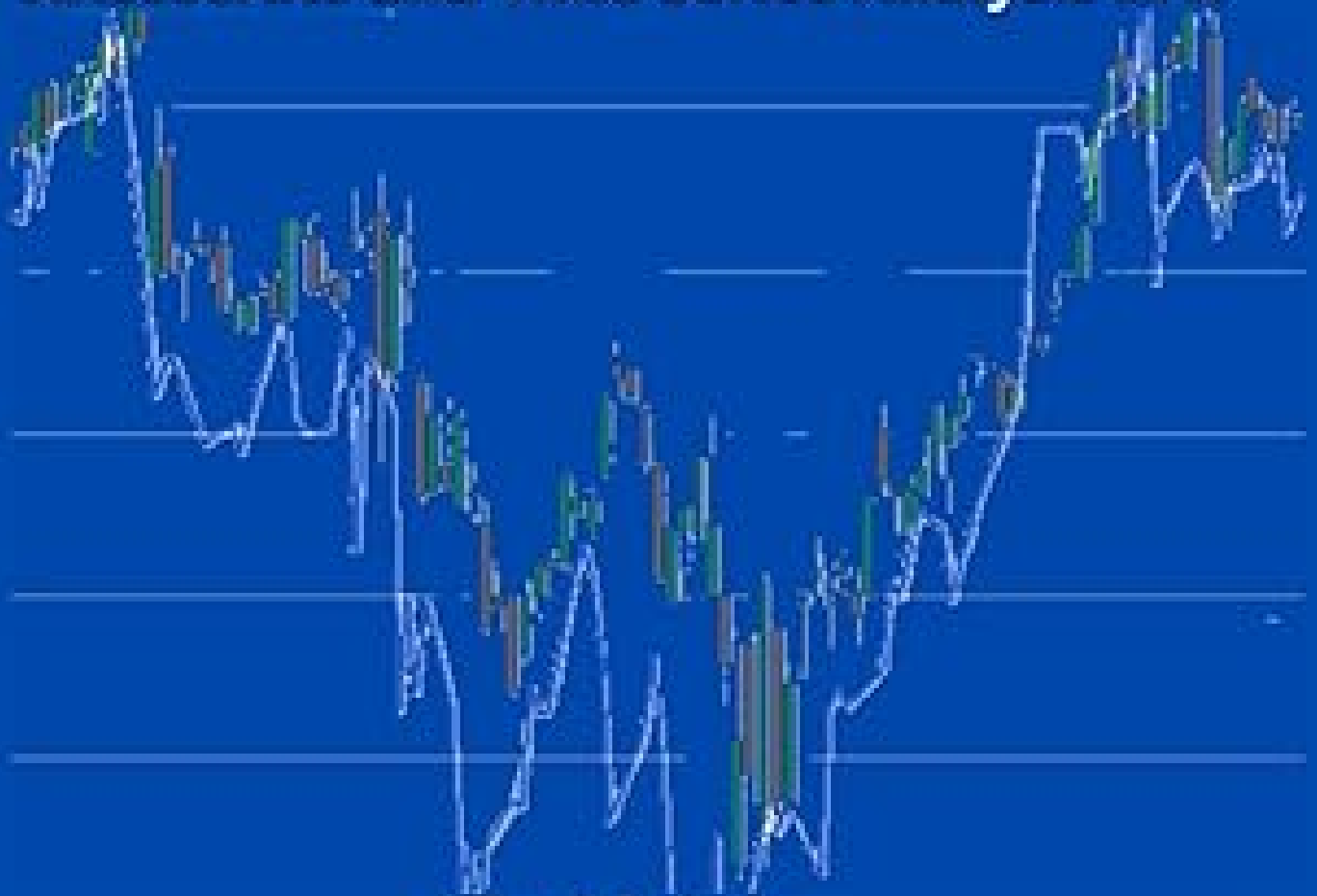
FOUNDATIONS OF TIME SERIES FORECASTING FOR CANADIAN DIVIDEND STOCKS

An Introduction to Canadian Dividend Aristocrats and Time Series Analysis in R



Chuck Egboka

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Cuttell Publications

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Dedication

To every DIY investor who dares to learn,

question the status quo,

and use data to grow wealth with intention.

And to my family, your support is the foundation beneath every model and every line of code.

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Preface

The inspiration for this book series came from a simple yet powerful question: Can the average investor use data science to make smarter, long-term investment decisions, especially with trusted dividend stocks in Canada? The answer, I believe, is a resounding yes.

Canadian Dividend Aristocrats offer a rare combination of reliability, growth, and resilience in a world driven by financial noise and speculative hype. As a data analyst and long-term investor, I've always been fascinated by how we can harness data, specifically time series forecasting models in R, to better understand and project stock performance over time.

This first book lays the foundation for that journey. It's written for self-directed investors, financial analysts, students, and anyone curious about combining practical investing with the power of open-source analytics. We'll start with the basics: understanding the Dividend Aristocrats, setting up R, and introducing the time series models that drive the analysis throughout this series.

You don't need a PhD or a finance degree to follow along, just curiosity, a laptop, and a willingness to learn. Whether you're managing your own TFSA, building a personal investment model, or exploring the power of data for the first time, this book was created to guide you step-by-step.

By the end of this series, my hope is that you'll not only understand your portfolio better, but you'll also have the tools to shape its future with confidence.

Chuck Egboka
Author & Principal Consultant
Cuttell Consulting Services Inc.

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Chapter 1: Introduction

1.1 Why This Book?

Dividend investing is a proven strategy for generating passive income and achieving long-term financial stability. It is a great way to save towards retirement and build wealth for your children. **Canadian Dividend Aristocrats** stand out among dividend-paying stocks as companies that have consistently increased their dividends for many years. These stocks attract investors looking for stability, compounding returns, and recession resilience.

However, selecting the right Dividend Aristocrats isn't just about past performance, it's about predicting future returns. That's where **time series analysis in R** comes in. By leveraging statistical models like ARIMA, SARIMA, Exponential Smoothing (ETS), TSLM and Prophet, investors can make **data-driven forecasts** for stock price trends and dividend growth.

This book provides a **step-by-step guide** on using time series forecasting to analyze **11 Canadian Dividend Aristocrats** and predict their performance over **1-year, 5-year, 10-year, 15-year and 20-year periods.** We will also allocate **$807** (the sum of each selected stock price) into a **Tax-Free Savings Account (TFSA) using Wealthsimple** and track its performance against the model's predictions. This real-world simulation will help us assess the effectiveness of time series forecasting in financial decision-making.

1.2 Who Is This Book For?

This book is designed for a wide range of readers:

- **Dividend Investors**: Learn how to forecast dividend stock performance and refine your long-term investment strategy.
- **Data Scientists & Analysts**: Gain hands-on experience with time series forecasting in R applied to real financial data.

- **Traders & Finance Professionals**: Use predictive analytics to identify undervalued dividend stocks and optimize portfolios.
- **DIY Investors**: Build your **data-driven stock analysis framework** without relying on professional advisors.

Whether you're an investor looking for quantitative tools or a data analyst eager to explore financial forecasting, this book will equip you with practical skills and real-world applications.

1.3 What You'll Learn in This Book

By the end of this book, you will:

✓ Understand the **principles of dividend investing** and why Canadian Dividend Aristocrats are reliable wealth builders.

✓ Learn the fundamentals of **time series analysis** and **forecasting in R**.

✓ Apply **ARIMA, SARIMA, ETS, and Facebook Prophet models** to **predict stock prices**.

✓ Build a **data-driven investment approach** by forecasting dividend stocks over **1-year, 5-year, 10-year, 15-year and 20-year periods**.

✓ Work through **real case studies** of **11 Canadian Dividend Aristocrats**.

✓ Compare model forecasts vs. actual stock performance through a **$807 TFSA investment simulation using Wealthsimple.**

✓ Use **data visualization and statistical validation techniques** to improve forecasting accuracy.

1.4 Prerequisites to Run the Code

Before diving into the coding sections, ensure you have the following installed and set up:

1. Required Software

- **R (Latest Version)** – Download from CRAN
- **RStudio (Recommended IDE)** – Download from RStudio

2. Required R Packages

Run the following command in R to install all necessary libraries:

```
# install.packages(c("quantmod", "tidyverse", "forecast", "tseries",
#                    "PerformanceAnalytics", "TTR", "ggplot2", "zoo"))
```

You don't need to install these right now since we will have the opportunity to install more packages in Chapter 3.

Remember, if you want to run these packages, libraries and codes, and they are commented out, you have to uncomment them to be able to run them.

3. Data Sources

- **Stock Price Data:** Fetched from **Yahoo Finance** via the quantmod package.
- **TFSA Portfolio Tracking:** Wealthsimple account (optional but recommended).

4. Basic Knowledge Assumptions

- Familiarity with **basic R programming** (e.g., loading data, running scripts).
- Basic understanding of **financial markets, stock prices, and dividends**.
- Some exposure to **statistical concepts** (mean, variance, correlation, time series).

If you are new to R, refer to **Appendix A: Introduction to R for Financial Analysis**, which covers R basics to get started.

1.5 Why Time Series Analysis in R?

Financial markets are complex, but time series analysis helps uncover patterns and trends that can guide investment decisions. Using **R** for stock forecasting provides several advantages:

- **Powerful statistical tools**: R includes advanced packages like forecast, tseries, and tidyquant for accurate stock predictions.
- **Open-source and widely used**: R is the preferred tool for academics, data scientists, and financial analysts.
- **Scalable modeling**: Time series techniques can be applied to individual stocks, ETFs, and entire portfolios.
- **Real-world investment application**: Time series forecasting helps investors **identify buy/sell opportunities**, reduce risk, and plan dividend reinvestment effectively.

By mastering **time series forecasting in R**, you gain an edge in predicting market trends and improving your dividend investment strategy.

1.6 Structure of the Book and Book Series

This is Book 1 in the 6-book series. The book series follows a structured approach to ensure that both investors and data enthusiasts can apply the concepts effectively.

Book 1: Foundations of Time Series Forecasting for Canadian Dividend Stocks

- **Chapter 2: Understanding Canadian Dividend Aristocrats**
    - What qualifies a stock as a Dividend Aristocrat?
    - Historical performance trends and key financial metrics.
- **Chapter 3: Introduction to Time Series Forecasting in R**
    - Fundamentals of time series data.

- Key forecasting models: ARIMA, SARIMA, ETS, and Prophet.
- Setting up your R environment and importing stock data.

Highlights:

- Introduces the Canadian market context.
- Walks readers through R environment setup.
- Explains key forecasting models.

Book 2: Preparing Data for Dividend Forecasting Models

- **Chapter 1: Data Collection & Preprocessing**
  - Where to source stock market data (Yahoo Finance, Tidyquant).
  - Cleaning and structuring data for analysis.
- **Chapter 2: Exploratory Data Analysis (EDA)**
  - Identifying trends, seasonality, and volatility in dividend stocks.
  - Visualizing time series data with R.
  - Preprocessing the 11 stocks' closing prices.

Highlights:

- Loading stocks data from Yahoo Finance.
- Conducting exploratory data analysis.
- Visualize and analyze returns.

Book 3: Building and Validating Stock Forecasting Models

- **Chapter 1: Time Series Models for Forecasting**
  - ARIMA modeling for predicting stock prices.

  - SARIMA for trend and seasonality.
  - Exponential Smoothing (ETS) for dividend trends.
  - Facebook Prophet for long-term forecasts.
  - Fitting the models.
  - Comparing models' performance.
- **Chapter 2: Backtesting and Model Validation**
  - Splitting time series data.
  - rolling forecast and walk-forward validation.
  - Evaluation metrics.
  - Backtesting with different models.
  - Comparing the models.

Book 4: Forecasting TFSA Growth Using Canadian Dividend Stocks

- **Chapter 1: Forecasting Portfolio Growth in a TFSA Using Wealthsimple**
  - Wealthsimple TFSA overview.
  - Initial $807 investment allocation.
  - Simulate growth.
  - Dividend payment forecasting.
  - Portfolio projection.

Book 5: Measuring and Comparing Forecasting Model Performance

- **Chapter 1: Comparing Forecasted vs Actual TFSA Performance**
  - Tracking actual Tax-Free Savings Account (TFSA) performance.

- Visualizing portfolio forecast vs actual comparison.
- Stock-level accuracy.

- **Chapter 2: Comparing Forecasting Models Across Stocks**
  - Summary of key insights.
  - Expanding your knowledge in financial data science.
  - Model selection framework.

Book 6: Interactive Forecasting with Shiny and Real-World Applications

- **Chapter 1: Building a Shiny Web App to Track Stock Performance**
  - Design and build the app.
  - Run the app.
  - Deploy into production as a web app.
- **Chapter 2: Practical Investment Applications**
  - Integrating Time Series Forecasting with Fundamental Analysis.
  - Risk Management Strategies for Dividend Investing.
  - Comparing Passive vs. Active Dividend Investing Approaches.
  - Tools and Platforms for Implementing Investment Strategies.
- **Chapter 3: Conclusion and Next Steps**
  - Key takeaways.
  - How Accurate Were Our Predictions.
  - Expanding the Series: What's Next for Future Book Series?

Pages 14-119 are not included in this sample

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About The Author

Chuck Egboka is a data analyst and consultant with over a decade of experience using data science to solve real-world problems. Formerly a natural gas reservoir engineering sessional lecturer and data analytics instructor, he is a registered Professional Engineer in Canada. As Principal Consultant at Cuttell Consulting Services Inc., he specializes in time series forecasting, R programming, and DIY investment strategies, including Canadian Dividend Aristocrats. Through this series, he helps readers use practical tools to grow and manage their portfolios with confidence.

FOUNDATIONS OF TIME SERIES FORECASTING FOR CANADIAN DIVIDEND STOCKS

Are you curious about how data science and time series forecasting can help you grow your wealth with Canadian Dividend Aristocrats? In this beginner-friendly guide, you'll explore the foundational concepts behind stock forecasting using R.

Learn how to identify long-term dividend-paying stocks, understand their significance in Canadian markets, and begin your journey into time series analysis, all with zero fluff and real-world examples.

This book is the starting point of a transformative 6-part series that equips you to take control of your TFSA and long-term investment strategy.