Financial Modeling for Decision Making

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Financial Modeling for Decision Making: Using MS-Excel in Accounting and Finance

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Accounting is About More than Just Numbers
... it's About Making Better Decisions

United Kingdom – North America
Japan – India – Malaysia – China

Emerald Publishing Limited
Howard House, Wagon Lane, Bingley BD16 1WA, UK

First edition 2020

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN: 978-1-78973-414-0 (Print)
ISBN: 978-1-78973-413-3 (Online)
ISBN: 978-1-78973-415-7 (Epub)

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Certificate Number 1985
ISO 14001

INVESTOR IN PEOPLE

I dedicate this book to the memory of my late brother,
Martin Oscar Messer, who left this world much too soon.

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About the Author

Snapshot

Ron Messer is a faculty member of the School of Business at Kwantlen Polytechnic University whose research interests focus broadly on management accounting and decision making. A graduate of six universities, Ron holds undergraduate and graduate degrees in both public and business administration. He is a CPA, a Chartered Accountant, and a Certified Management Accountant with 25 years of working experience in accounting, finance, and information systems. His essays have appeared in publications in Canada, the United States, and the United Kingdom.

Key Research

Ron Messer's primary areas of interest include organizational strategy, financial planning, and supply chain management (with an emphasis on logistics). To this end, he has published in peer-reviewed academic journals (14 essays), industry-specific journals (six articles), chapters in authoritative texts (four chapters in four books), and business case studies (two teaching cases).

Organizational Strategy

Based on his strategy research, Ron developed a method for charging airport landing and terminal fees that optimizes the social welfare for both the traveling public and private sector operators. In conjunction with this work, Ron also proposed a pricing framework for private sector airports. With respect to the public sector, he suggested a renewed focus on organizational vision, whereby the government adopts private sector values in the delivery of its services.

Financial Planning

In the area of financial planning, Ron proposed a budgeting method that eliminates many of the problems encountered when companies prepare their annual financial plan. He also created a process for identifying budget "cheaters," which allows for the creation of more realistic business plans and avoids the inefficient allocation of corporate capital.

Supply Chain Management

In an essay written almost two decades ago ("Airports, Air Cargo and the Internet"), Ron outlines the possible effects of e-commerce on airports as logistics hubs in the supply chain. In this paper, Ron predicts that Internet-enabled business models will lead to increased air cargo and possible on-airport manufacturing facilities. Recent evidence surrounding the development at Indian airports (with the production of off-patent pharmaceuticals), the United Parcel Services aviation group (servicing laptop

computers), and the many "fulfillment" centers under construction at, or near, airports (Amazon) provides evidence to support this hypothesis.

Impact of Research

Ron Messer's essays on supply chain management and logistics describe the impact of e-commerce on aviation globally. In the area of organizational strategy, Ron has proposed a way in which university business programs can distinguish themselves and become world-class institutions.

Overall, Ron's research is helping to develop strategies so that governments can deliver public services more effectively, including airports operating in deregulated environments. His work is influencing the way private and public institutions operate by proposing efficient methods that are globally relevant.

What's Next?

Ron recently published a business case that was used as part of a competition for management accounting students across the United States, along with teaching notes. He has also completed a paper that discusses enhanced teaching methods for management accounting. His most ambitious project to date is examining decision making in speculative markets to understand the underlying mechanisms that govern participant behaviors. This involves analyzing large data sets and developing several heuristic models.

Check out Ron online at:

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and

Google Scholar: https://scholar.google.ca/citations?user=K95HjQMAAAAJ&hl=en

Brief Summary

This book was written with two objectives in mind:

(1) *To be useful for making business decisions.*
(2) *To show how MS-Excel can be applied to making these decisions.*

It is the type of publication that I wish I had when I was learning how to use this popular spreadsheet package. For the most part, the training I received was disjointed, lacked focus, and did not establish a context for using MS-Excel; for example, how to develop a financial model to decide whether to pursue a business opportunity. For this reason, the starting point for each chapter is a business decision that needs to be made. Each decision is supported by the relevant accounting/finance theory, and then (and only then) is Excel introduced as a tool for addressing a management problem. This process reverses the method commonly used for teaching Excel, where the functionality is demonstrated and then applied to a disparate set of case facts – an approach that incorrectly attempts to find a problem for a solution.

This book provides accounting students in post-secondary institutions with an advanced level understanding of how to use MS-Excel. It reflects real-life applications of this important analytical tool, which has become the industry standard for spreadsheet software. The text focuses on using MS-Excel in situations encountered by accounting and finance students and professionals; these are contextualized in terms of the past, present, and future and reflect a typical operating cycle, which includes initial planning, followed by exercising control, and is completed when feedback is received.

The book also addresses the growing need for data analytic skills (i.e., "big data") and the recent innovations by MS-Excel in this regard, including Power Query (data cleaning and management), Power Pivot (advanced pivot tables using databases), and Power BI (creating executive KPI dashboards). However, while data analytics is important in financial management, it must be remembered that it forms only part of the larger picture that is captured by financial modeling.

The Excel 'shell' files that are used in conjunction with the financial modeling exercises shown in this book are available through the Emerald Publishing website. The completed solutions for the financial models can also be found there.

The Excel files are located at URL: https://bit.ly/finmod2020

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Preface

All companies use some type of spreadsheet application in the day-to-day operation of their Accounting and Finance departments. This can be as a stand-alone tool (e.g., mortgage calculator; amortization schedule), or – particularly for smaller companies – a significant part of their financial systems (e.g., payroll application; inventory subledger). For this reason, acquiring competencies in MS-Excel will be extremely valuable for students when they are applying for jobs and will help them tremendously during their employment interviews. Robert Half, the finance and accounting recruiting specialists, have noted in their most recent employer survey that advanced level knowledge of MS-Excel if one of the most sought-after skills by prospective hiring managers.

So, why do we need another textbook on using MS-Excel for business? Unlike previous publications that have focused primarily on management science applications, this text is specifically geared to business decisions that require financial modeling techniques used in Accounting and Finance departments. The applications discussed and models presented are based on the working experience of the author over his more than 25 years of employment in various areas of financial management. In addition, the text structures the practical usage of MS-Excel for decision making in the context of time: past, present, and future. In contrast, many books on this subject are relatively unstructured and dominated by esoteric and infrequently used applications of MS-Excel, primarily for academic audiences.

This text is ideally suited to a one-semester, senior undergraduate course of 14 weeks and addresses the competencies required by professional accounting associations, such as those offering the CPA and CMA designations. It covers the use of MS-Excel in:

- Break-even analysis, for new venture decisions
- Time series forecasting, for sales demand decisions
- Capital budgeting, for major investment decisions
- Regression analysis, for predictive analytics decisions
- Linear programming, for product mix and scheduling decisions
- Corporate valuations, for equity financing decisions
- Data analytics, for customer buying decisions
- KPIs using dashboards, for strategic decisions
- Budget development, for performance management decisions
- Amortization tables, for debt and asset management decisions

Each chapter can be covered in one weekly computer lab, with chapters one and two combined in the first session. This allows for 10 weeks of instruction, two mid-term

tests, and one final exam. Chapter 12 integrates materials from the prior chapters and can be used as a stand-alone capstone project for students to complete.

Unique Aspects of this Book

This book is different from similar publications in several respects.

Focus on Accounting and Finance: Most texts that cover using MS-Excel for business address management science applications and do not deal specifically with accounting and finance situations. This book will be valuable to both accounting students as well as financial management professionals for making business decisions.

Practical applications: The content of this book will be immediately relevant to students and practitioners who are, or will be, dealing with similar situations in their professional work. For example, using capital budgeting models to make billion-dollar investment decisions, or developing corporate valuation models to price shares for an IPO.

Real-life examples: The Excel functionality used in decision making is based on the author's more than 25 years of financial management experience. The text will address common business decisions made by financial management professionals.

Decision-making emphasis: Employers want their newly hired employees to assist them in guiding the company. The focus of the book is on making sound business decisions that provide value for the enterprise.

Employer demand: Based on feedback received from our university's alumni and those who hire our graduates, companies increasingly want their employees to have advanced level MS-Excel skills. This book addresses that need. Feedback from our degree holders tells us that the organizations that employ them are impressed with their knowledge of MS-Excel.

The book addresses the day-to-day work done by Accounting and Finance staff in a company. This is illustrated in the table below, which shows how everyday business decisions relate to the accounting and finance concepts addressed in the topical coverage in the text (Table 1).

The book is also different from competing publications because it addresses real-life business situations that the author has encountered during his more than 25 years of work experience. This is summarized in the table below, along with references to the related MS-Excel functionality that is used in the demonstration exercises in the book (Table 2).

Organization of this Book

The book is organized around three dimensions relating to the decisions made by accounting and finance students and professionals, including: (1) time frame, (2) accounting cycle, and (3) financial analytics.

(1) The decision context based on time frame includes the future, present, and past. Note that the normal chronological sequence has been reversed in this book to better align with the accounting cycle.

Table 1. Everyday Business Decisions Covered in this Book.

Business Decisions	**Accounting/Finance Concepts**	**Book Topics (and Chapters)**
New business venture	Cost-Volume-Profit analysis	Break-even models (Chapter 2)
Long-term planning	Financial forecasts	Time series forecasting (Chapter 3)
Major investment	NPV, IRR, payback period	Capital budgeting models (Chapter 4)
Predicting the future	Data analytics	Regression analysis (Chapter 5)
Product pricing	Cost-Volume-Profit analysis	Linear programming (Chapter 6)
Financial reporting	Income Statement, Balance Sheet, Cash Flow	Corporate valuations (Chapter 7)
Equity financing	Business valuations	Corporate valuations (Chapter 7)
Interpreting financial information	Descriptive analytics Diagnostic analytics	Data analytics (Chapter 8)
Performance measurement	Key performance indicators	KPIs and Dashboards (Chapter 9)
Corporate strategy	Pro-forma financial statements	KPIs and dashboards (Chapter 9)
Cash management	Cash budgeting	Budget management (Chapter 10)
Budget management	Responsibility accounting and variance analysis	Operating budgets (Chapter 10)
Debt financing	Bond/loan pricing and amortization	Amortization tables (Chapter 11)

(2) The accounting cycle includes distinct phases for planning (future orientation), control (thinking about the present), and feedback (using what has been learned from the past).
(3) Decisions based on the future allow businesses to make plans – using predictive analytics. Decisions made in the present emphasize control, since they guide day-to-day actions – using descriptive analytics. Decisions using past information are reflective and give feedback about the effectiveness of plans in relation to actual results – using diagnostic analytics.

This schema is shown below and reflected in the chapter sequence of the table of contents. The dimension columns are organized according to the time frame in which the decisions are made. They include the applicable part of the accounting cycle and the related financial analytic techniques. The financial models discussed in the book are also listed, based on the applicable time frame and stage of the accounting cycle to which they relate (Table 3).

Table 2. Everyday Business Decisions and Real-life Examples.

Business Decisions	**Real Life Examples Using MS-Excel**	**MS-Excel Functionality (UPPERCASE Lettering)**
New business ventures	I have developed financial models to assess the profitability of new business opportunities.	Cost-volume-profit models using GOAL SEEK, DATA TABLES, and SCENARIOS
Long-term planning	I have used forecasting techniques to estimate corporate revenues.	Forecasting techniques in the ANALYSIS TOOLPACK MOVING AVERAGE EXPONENTIAL SMOOTHING
Major investments	I have created capital budgeting models for multimillion-dollar land development projects in both domestic and foreign locations.	NPV, IRR
Predicting the future	I have developed a predictive model, using linear regression techniques, for an organization's program spending.	ANALYSIS TOOLPACK: REGRESSION
Product pricing	I developed a process for pricing the use of airport facilities by using linear programming techniques.	Using SOLVER to optimize product/service pricing
Financial reporting	I have created a monthly management reporting system that monitored corporate performance in relation to an organization's budget.	Variance analysis and FORECAST functions were used
Equity financing	I have published an essay that deals with the use of equity financing for private airports.	Using PIVOT TABLES to analyze various financial datasets
Interpreting financial information	I have prepared analytical reports, based on information obtained from a large data warehouse, using advanced data analysis tools (i.e., Hyperion and Essbase software that interfaced with MS-Excel)	PIVOT TABLES and BI (Business Intelligence) tools were used
Performance measurement	I have identified key performance indicators (KPIs) for monthly reporting to senior management.	Creating executive dashboards, using PIVOT TABLES, SLICER and SPARKLINES functions
Corporate strategy	I was involved in developing a strategic plan for a subsidiary of a large business. I have also authored essays on corporate strategy.	Employed ANALYSIS TOOLPACK forecasting using MOVING AVERAGE and EXPONENTIAL SMOOTHING techniques
Cash management	I have been responsible for managing multi-million-dollar cash portfolios, through purchases of *R*1 and *R*2 rated short-term commercial paper.	Created a financial model (using Excel GRAPHICS) to match risk with return on a portfolio of investments
Budget management	I have developed and managed multi-million-dollar operating and capital budgets for several organizations.	Amalgamated cost center budgets using the CONSOLIDATION function along with PIVOT TABLES tools
Debt financing	I have published an essay dealing with the use of debt financing in relation to residual and compensatory airport pricing models.	Various financial functions: NPV, IRR, PV, FV, RATE along with SOLVER

Table 3. Aligning Financial Modeling Dimensions with the Decision-making Context.

Modeling Dimensions	**Decision-making Context**		
Time frame	Future	Present	Past
Accounting Cycle	Planning	Control	Feedback
Financial Analytics	Predictive analytics	Descriptive analytics	Diagnostic analytics
Financial Models	Break-even Time-series forecasts Capital budgeting Regression analysis	Linear programming Business valuation Pivot tables	Financial dashboards Budget management Amortization tables

This book is designed for advanced Excel applications and therefore students require an intermediate level knowledge of the software, focused primarily on the functional aspects of using Excel. This will include coverage of the following topics.[1]

Working with Excel Tables, Pivot Tables, and Pivot Charts:

- Explore a structured range of data
- Freezing rows and columns
- Creating an Excel table
- Plan and create an Excel table
- Rename and format an Excel table
- Add, edit, and delete records in an Excel table
- Sort/Filter data
- Insert a Total row to summarize an Excel table
- Split a worksheet into two panes
- Insert subtotals into a range of data
- Use the Outline buttons to show and hide details
- Create and modify a Pivot Table
- Apply Pivot Tables styles and formatting
- Filter and sort a Pivot Table
- Insert a slicer to filter a Pivot Table
- Group Pivot Table items (Home Group/Group Field)
- Create a Pivot Chart

[1]The list of topics covered for an intermediate-level knowledge of Excel was supplied to me by my colleague, Richard Wong, who is a faculty member in the School of Business at Kwantlen Polytechnic University.

Managing Multiple Worksheets and Workbooks:

- Create a worksheet group
- Format and edit multiple worksheets at once
- Create cell references to other worksheets
- Consolidate information from multiple worksheets using 3-D references
- Create and print a worksheet group
- Create a link to data in another workbook
- Create and print a worksheet group
- Create a link to data in another workbook
- How to edit links
- Create and use an Excel workspace
- Insert a hyperlink in a cell

Developing an Excel Application:

- Create, edit, and delete defined names for cells and ranges
- Paste a list of defined names as documentation
- Use defined names in formulas
- Add defined names to existing formulas
- Create valid rules for data entry
- Protect the contents of worksheets and workbooks
- Add, edit, and delete comments
- Macros (create, save)

Working with Advanced Functions:

- Working with Logical functions (IF, AND, and OR)
- Working with comparison operators such as <, <=, = <>, >, or >= to compare two values
- Inserting calculated columns in an Excel Table
- Using structured references in formulas (Fully qualified and Unqualified)
- Nest the IF function
- Using the VLOOKUP and HLOOKUP functions (to find approximate and exact match)
- Use the IFERROR function
- Use conditional formatting to highlight values
- COUNTIF, SUMIF, AVERAGEIF

Exploring Financial Tools and Functions:

- Work with financial functions such as FV, PV, RATE, NPER, and PMT
- Interpolate and extrapolate a series of values (Home Editing Fill Series)
- Determine a payback period
- Calculate a net present value (NPV) and an internal rate of return (IRR)

Performing What-If Analysis (Data, Data Tools, What-If Analysis):

- Perform what-if analysis with Goal Seek, Data Table, Scenario Manager, and Solver.
- Use Goal Seek to calculate a solution (Goal Seek)
- Create a one-variable data table (Data Table)
- Create a two-variable data table (Data Table)
- Create and apply different Excel scenarios (Scenario Manager)
- Generate a scenario summary report
- Generate a scenario PivotTable report
- Run Solver to calculate optimal solutions (Data Table)
- Create and apply constraints to a Solver model
- Save and load a Solver model

Connecting to External Data:

- Import data from a text file (Data, Get External Data, From Text)
- Working with connections and external data ranges (Data, Connections group)
- Define a trusted location

Collaborating on a Shared Workbook:

- Integrating Excel with Other Office Applications
- Understanding copying and pasting, linking, and embedding objects into Word document
- Linking Excel and Word Files
- Updating a linked object
- Embedding an object
- Modifying an Embedded Object

With these topics as a foundation, the text incorporates more advanced functionality into decision making for accounting and finance students and professionals.

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Introduction

Chapter 1

Better Learning Decisions

So, what is this book about?

This book is about financial modeling. It deals with the types of business decisions made by accounting and finance students and professionals. The book's purpose is to teach advanced Excel techniques. All employers value these skills in their staff, and it is expected that the material covered will enhance students' employment prospects and the career advancement of professionals.

Works of this genre are typically part of a management science curriculum and consequently are focused on some topics that Accounting and Finance practitioners do not consider relevant in their day-to-day routine—such as Monte Carlo simulations, using real options and integer programming. Different from many books that explain how Excel is used for decision-making, this text focuses specifically on Accounting and Finance department applications. Each of the decision contexts explored is based on the personal experience of the author, whose employment history includes the following areas of financial management:

- Budget development and management
- Product and service costing and pricing
- Cash management
- Financial reporting
- External and internal auditing
- Evaluating information systems risk and controls
- Enterprise risk management
- Personal and corporate taxation
- Corporate finance
- Capital budgeting
- Financial systems development and implementation
- Developing financial policies and procedures

By using this book, students and professionals will develop an *expert*-level proficiency with Excel and apply these skills to problems in cost accounting, capital

budgeting and linear programming. Statistical techniques, such as single- and multivariable regression analysis and forecasting, will also be discussed. Students will learn to work with pivot tables applied to data mining and analysis situations. They will also develop pro forma financial statements and build a discounted cash flow model for purposes of valuing a company. In addition, Excel will be used to create a budget, perform variance analysis, and develop key performance indicators (KPIs), along with executive dashboards. Also addressed will be several common amortization tables used for decision-making.

How to Learn (and Teach) Financial Modeling

Learning Financial Modeling

A common lament heard from those taking Excel training courses is that they thought that they had learned some important techniques but, because they did not put them into practice, the knowledge acquired was soon forgotten. It is not surprising therefore that many people learning how to use the software repeat the same—or similar courses—year after year, which is both expensive and inefficient. This occurs because Excel courses usually focus on either (1) functionality or (2) application, but seldom both. Functional courses address the technical aspects of the software, such as how to create pivot tables. Application courses address the use of Excel for specific problems; for example, preparing a capital budgeting model. Uniquely, this text combines both of these aspects, integrating functionality and application; it explains Excel functions as well as their application to common business problems.

The book is purposefully structured to address common weaknesses in how MS-Excel is taught—to this end it emphasizes being useful to those operating a business. When I worked as a financial systems analyst, one of the most important things I learned was that software should never drive an organization's operations; business operations are primary and must always dictate computerized functionality. This means that the starting point for learning how to use Excel should not be the application itself, but rather the decisions made within the business—such as whether to invest in capital assets. It is for this reason that the text *first* addresses common business decisions, then explains the underlying management theory used in making these decisions and finally proceeds to show how Excel can be employed to decide on a course of action. By taking this approach it turns the traditional "how to teach Excel" approach on its head and hopefully puts end users (and not techies) in charge of the learning process.[1]

For each decision-making context (future, present, and past), a topic is explored in terms of its primary subject area and the types of decisions made. Real-life business situations are described, which are then explored in terms of the underlying theory and financial management techniques used. To facilitate decision-making, the requisite Excel functionality is demonstrated through a detailed exercise.

The chapters follow a consistent format, with examples of real-life Excel applications and include these parts:

[1]The obsession with the technical aspects of the software is evidenced by the many Excel course instructors who have advanced degrees in applied mathematics, operations management, and computer science who are fascinated by the arcane minutiae of the application, but seldom clearly explain its practical usage (think: "ivory tower" mentality).

- *Snapshot*: A chapter overview for each decision context, outlining the (1) topic, (2) subject area, (3) decisions made, (4) author's experience, and (5) relevant Excel functionality for building the financial model.
- *Background theory*: As this book addresses both Excel functionality and its application to decision-making, an overview of the relevant accounting and finance theory will be provided—for example, a discussion of discounted cash flows and using the weighted average cost of capital (WACC) when making capital budgeting decisions.
- *Financial management techniques*: The section will address the formulas used in decision–making—for example, the calculation of the break-even point in unit sales is: Fixed costs ÷ unit contribution margin.
- *Using Excel functionality*: The key Excel functions, including formulas, for each decision-making context are discussed.
- *Demonstration Exercise*: A detailed, guided exercise on using Excel to develop a financial model for decision-making is shown.
- *Afterthought*: The author provides some—hopefully, thought-provoking—commentary on the chapter topic as food for thought.

Teaching Financial Modeling

Teaching computer applications is very different from the instruction that takes place during a standard lecture session. It is challenging because a happy medium needs to be achieved between speaking and hands-on practice. As a heuristic, I use a 50/50 ratio—i.e., I spend about half of the class time explaining and demonstrating the application of Excel to decision-making and the other half having students practice their skills. Rather than using a follow-along (i.e., Simon says) approach—where students mimic the keystrokes shown on a screen at the front of the classroom—I provide a context for the decision being made (e.g., determining the valuation for a company), demonstrate how Excel can be used to make the decision and then have them work through a demonstration exercise (using a preformatted Excel "shell" file) at their own pace. As students progress through the exercise, I walk around and troubleshoot, giving assistance when it is needed. I also provide a thorough debriefing on the financial model and post it to a course website for students to review. This process allows both slower as well as more advanced students to have a sense of achievement in working toward a solution, without the frustration of having to catch up to the instructor. My experience as both a teacher and a student has convinced me that this is the most effective way to teach (and learn) these skills.[2]

This book is based on Excel 2016 (although it also applies to Excel versions 2010 to 2013 or Excel 365, which is available free of charge to academic users). Each chapter builds on content developed in prior chapters. The starting point for a section is the decision context, whereby upfront planning (covered in Chapters 2–5) leads to management control (covered in Chapters 6–8) which leads to feedback being received (covered in Chapters 9–11). This is articulated through the management theory relating to the decision (for example, a discussion of the calculation and significance of break-even points when deciding whether to start a new business).

[2]I estimate that I have completed several hundred hours in Excel training and in the process been subjected to a number of pedagogies. Based on this experience, I have taken what I believe to be the most effective teaching strategies and incorporated them into my courses, as well as this book.

Only after the groundwork for the business decision has been laid is Excel functionality introduced through a detailed demonstration exercise, providing step-by-step instructions for its completion.

Steps in Developing a Financial Model

The process for creating a financial model includes these considerations[3]:

(1) *Define the problem:* This can be "trickier" than you think and involves careful consideration of the underlying dynamics of the phenomenon being investigated. Here, it is important to take the time necessary to clearly understand the real (as opposed to surface) issues that need to be addressed. (For example, should we invest in an infrastructure development project in Central America and on what basis do we determine our risk-adjusted discount rate for this capital budgeting decision?)
(2) *Gather the data:* This includes identifying the source of the data (internal or external) and whether they exist or need to be collected. (For example, determining net cash flows by identifying the sources of cash inflows and outflows over the project time horizon.)
(3) *Develop the model:* This involves selecting the type of financial model required, which will be determined by the nature of the Excel application being created. (For example, a capital budgeting model is used to make decisions about large investments in the future, whereas a budget variance analysis addresses financial planning decisions made in the past.)
(4) *Optimize the model:* This means making the model efficient by reducing the number of processing steps or using better processes. Excel has several ways of performing the same task (known as, functional redundancy) and some methods will be better than others, depending on the application. (For example, when processing large quantities of data, it is sometimes better to obtain this information from another source, such as an Access database, and then import only those portions of the data—field and/or records—required for specific purposes.)
(5) *Test the model:* The importance of quality assurance (QA) testing cannot be overstated. This involves performing calculations manually and then comparing the results with those generated by the application. (For example, comparing the internal rate of return (IRR) calculated by a capital budgeting model with the company's hurdle rate for investments to determine its reasonableness.)
(6) *Communicate the model:* This is your opportunity to shine by helping the company reduce uncertainty associated with important business decisions. (For example, convincing a room full of nervous investors that your multibillion-dollar infrastructure project in a foreign country is justified based on its net value present (NPV) and IRR.)

The financial models discussed in this text are listed in the table below (**Table 1.1**).

[3]This schema is partially based on that provided in Winston, W. L., & Albright, S. C. (2009). *Practical management science* (pp. 8–9). Mason, OH: Cengage Learning. More importantly, it reflects the author's real-life experience in developing financial models used to make decisions in the workplace.

Table 1.1. Summary of Financial Models.

Chapter	Financial Model	Key Excel Functionality
2	Break-even	Goal Seek; Data tables
3	Time-series Forecasting	Analysis Tool pack
4	Capital budgeting	NPV, IRR formulas
5	Regression Analysis	Analysis Tool pack
6	Linear Programming	Solver
7	Business Valuation	NPV, IRR formulas
8	Financial Analytics	Pivot Tables
9	KPIs & Dashboards	Charts, Slicers, Timelines
10	Budget management	Pivot tables, Consolidate
11	Financial Amortizations	PV, PMT formulas

The financial models will be illustrated using demonstration exercises that address important business decisions (which are shown below) (**Table 1.2**).

Some Common Excel Terminology

The table below describes the terminology used in this book to refer to various parts of the Excel application, starting with an overview and then proceeding from the top of the spreadsheet screen to the bottom (**Table 1.3**).

Note that when Excel functionality is discussed, it will be shown in capitalized text—for example, to create a data table, left click on the following: DATA, WHAT-IF ANALYSIS, DATA TABLE. To make the description of navigation within Excel consistent, the starting point in this text's explanations will always be the main menu screen.

Good Financial Modeling Practices[4]

Most companies that develop financial models have standardized procedures for doing so. This is to ensure that those who review or use the models can understand how they work—perhaps, more importantly—so that those who must update the models can understand them too. This book recommends these practices, for the reasons noted below (**Table 1.4**).

Demonstration Exercise

The following workbook application shows the evolution of a financial model, as it progresses from a somewhat idiosyncratic decision-making tool—probably only useful to its creator—to something more robust and comprehensible. A blank Excel "shell" file is available for students to build their own version of this model (file name:

[4]This list of modeling practices is similar to that provided in Winston, W. L., & Albright, S. C. (2009). *Practical management science* (pp. 24–25). Mason, OH: Cengage Learning; however, **Table 1.4** is more succinct and is based on the author's personal experience in creating and maintaining financial models.

Table 1.2. Summary of Demonstration Exercises.

Chapter	Company Name	Business Type	Decision(s) to Be Made
1	Alpha Corp.	Junior Achievement company, which is an NPO for high school entrepreneurs	Profitability of a business
2	Park & Wash	Car washing and detailing service	Viability of a new corporate opportunity
3	BWNR	Health supplement retailer	Estimating long-term sales volumes of a new product
4	WTF Builders	Construction company	Expected return on a major infrastructure project
5	Patrick Enterprises	Mechanical engineering firm	Determining product cost for purposes of pricing
6	Screw-it	Screw driver manufacturer	Controlling product mix
	Shoot-it	Hockey stick manufacturer	Controlling product scheduling
7	HAAK	Marijuana cultivation and retail sales	Share price for an Initial Public Offering
8	Food-*stuff*	Meal kit maker and retailer	Understanding customers and product choice
9	GIT-me Entertainment	On-site services for movie productions	KPIs and metrics for implementing company strategy
10	Chill-Dude	Snowboard manufacturer	Budget development and management
11	Geezer Ltd.	Mining Industry	Bond amortization Loan amortization Asset amortization
12	Omega Corp.	High-tech pencil holders	Everything, from soup (starting a business) to nuts (tracking performance)

Alpha Corp(shell).xls) by following the steps outlined below. (The case is based on the author's youthful experience as a budding high school entrepreneur and future accountant.)

Case Facts[5]

Bob (not his real name) is a high school student who has joined an organization known as Junior Achievement (JA), which is a nonprofit group whose purpose is to encourage young people to become entrepreneurs. Members are guided by a

[5]This exercise is based on one shown in Winston, W. L., & Albright, S. C. (2009). *Practical management science* (pp. 25–28). Mason, OH: Cengage Learning.

Table 1.3. Excel Terms.

Term	Meaning
Main menu	This is the Excel functionality that appears when the application is opened on your computer. It is the part at the very top of the screen and shows, from left to right: FILE, HOME, INSERT, etc.
Ribbon	The ribbon appears below the main menu when the application is activated and shows formatting functions, from left to right: CLIPBOARD, FONT, ALIGNMENT, etc.
Drop down box	This appears within a ribbon when Excel provides several functional options for a feature, such as what if analysis, which includes SCENARIOS, GOAL SEEK and DATA TABLES.
Check box	A check box allows you select and deselect certain features within an application—for example, which Excel add-ins to include in your main menu (like Solver).
Dialog box	A dialog box (sometimes referred to as a wizard") is a gray icon that appears on the spreadsheet screen and is used to input parameters when using Excel functionality—for example, the Solver application.
Formula bar	The formula box appears below the main menu ribbon and shows the formulas in the cells within a worksheet. (Formulas can also be seen by pressing the F2 function key or by double left clicking on the mouse.)
Name box	This appears to the left of the formula bar, below the main menu ribbon and can be used for creating named ranges (which is discussed below, as part of good modeling practice).
Column/row headings	Columns are shown as letters of the alphabet across the top of the worksheet, while rows are numbered along the side. An Excel worksheet can have more than 1 million rows in a single worksheet.
Worksheet	Sometimes called a tab." It is part of a workbook and appears at the bottom of the spreadsheet.
Workbook	A workbook is comprised of one or more worksheets.
Left-click/right-click	This refers to using the mouse to activate Excel functionality. Sometimes it is easier to use the mouse than working through the main menu. Note that there are typically several ways to perform functions in Excel (referred to as functional redundancy).
Linking files	This can mean either using cell references in other worksheets or workbooks as part of your calculations or creating a hyperlink to external workbooks or other data sources.
File option settings	This allows users to add or remove functionality from Excel, such as Solver (for liner programming), Analysis tool pack (for regression analysis and time series forecasting), and Developer (for creating custom applications).

Table 1.4. Good Modeling Practices.

Recommended Practice	**For this Reason** ...
Color coding cells that identify specific parts of the financial model: Light gray background cells are for *input* data; these values are hard-coded directly into a cell or by using the formula bar Medium gray background cells are for *decision* variables. Dark gray background cells are for *objective* functions, which are the values we are trying to determine.	Standardized color coding allows users to more easily understand how the application works and the types of data presented in the financial models.
Comment indicators (ensure that these are turned on" by using: FILE, OPTIONS, ADVANCED, DISPLAY, then select the checkbox for INDICATORS ONLY).	Providing comments in a cell within an Excel worksheet allows users to understand important information about the data, such as its source or the units being used.
Named ranges: Creating named ranges and listing named ranges.	Creating named ranges makes it much easier to understand the logic of the financial model, particularly when they are included in formulas.
Keep a separate worksheet for Data" in every workbook. (By convention I always use the left-most worksheet as my data tab.)	To ensure that data is not accidently overwritten, it should be kept separate from other functions in the financial model.
Do not cross-link workbooks.	Linkages within workbooks are extremely useful and often necessary for financial modeling. However, linking across workbooks can cause significant problems when links become corrupted, when files are moved across directories.

mentor from within the business community. A JA operations manual has several prepackaged business plans that can be used, or students can develop their own. To this end, Bob's firm (known as Alpha Corp.) has decided to manufacture pencil holders, which it intends to sell for a profit (probably, mostly to family members). The business will be in operation for one school term (September to December) and any merchandise remaining on December 25 will be sold at a fire sale price. There are 10 other students in the company, and Bob has been elected as the corporate controller because he likes using Excel.

The relevant financial information is as follows:

- Regular selling priece per pencil holder = $15 (from September to December 25)
- Fire sale price of pencil holders = $6 (after December 25)
- Fixed cost of production = $200 (covers a 4-month lease on equipment, including table saws and tube cutters)
- Variable costs per pencil holder = $8 (materials include aluminum tubes and wood for the base; utility costs for the production facility are borne by the non-profit organization JA)
- Expected sales = 200 (assuming every team member's extended family—estimated at 20 people each—purchases one pencil holder)
- Planned production = 150