

Gamification in the Corporate Finance Course

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Abstract

The Corporate Finance course has two major learning tools: a company analysis and the FinGame 5.0™ simulation. The course objectives cover materials relevant to the MBA, the ETS Major Field Test, and the MS in Financial Analysis. The professor added elements of gamification to the course as well as created a FinGame tracker file to aid students in the analysis of their decisions. Finally, the course's results are reviewed.

Keywords: Gamification, FinGame 5.0 simulation

Gamification in the Corporate Finance Course

The purpose of this paper is to present the findings when FinGame 5.0 was added to the graduate level Corporate Finance course and the gamification associated with the FinGame 5.0 simulation. As a part of the curriculum, the Fingame simulation was added to the MBA Corporate Finance course; correspondingly, the percentage of the final grade was amended between a team company analysis and the individual FinGame report as major elements. Simulations and gamification were reviewed in the literature. Then, results will be shown and explained via a before-and-after of the output from FinGame. Finally, the elements of gamification will be discussed that were added to the simulation process.

Finance simulation

Simulations and games are high impact practices in financial education. FinGame has been around on disk since the 1970s, and, are now the web-based applications (Brooks, 1975). In addition, other financial games have been developed. StockTrak is a well-known commercial investment simulation. The Broker Game teaches about futures (Alonzi, 2000). McClatchey and Kuhlemeyr (2000) present survey data and a review of the stock market games. They find that the games are easy to integrate into the classroom, illustrate and supplement knowledge, and incorporate financial information. The main advantage for pedagogy is to experience the theory and models that are often complex and require mental effort.

FinGame

FinGame is the financial management simulation. Students or teams of students make decisions that affect the value of a corporation. The game requires 20 decisions in the areas of operations (working capital), financing (capital structure and residual payout policy), and investing (capital budgeting and demand analysis). FinGame requires an understanding financial economic theory and financial accounting; the knowledge of product demand, cash flow, and production investment and

acting on those insights (Brooks, 1975). The main difficulties are in the students' ability to use financial statements and perform Pro Forma analysis. There is an emotional effect in playing the game, not failing.

Pleasantly frustrating

One concept for customizing and gaming the course is to make learning "pleasantly frustrating" (Bowen, 2012). According to "Make it stick: the science of successful learning," gamification meets several of the criteria to be effective. de Souza Vieira, Peixoto Saibert, Neto, Mota da Costa, and de Souza Paiva (2018) contend effectiveness via three areas that relate to gamification: "retrieval and self-testing", "failure," and "interleaving." Retrieval is activating the neural pathways of the brain for memory. In the course, it begins with reading the chapter and viewing the narrated slides on financial statements, then it is practiced in FinGame. Success in FinGame is dependent on perusing the financial statements and preparing future decisions with pro forma statements. At first, it is difficult for students to making the first quarterly decision. Playing several quarters in FinGame incorporates retrieval and self-testing.

The concept of "failure" is enacting a process from feeling "confident of your knowledge" towards demonstrating mastery. Between knowledge and mastery, interleaving of "practice" of mixed problems lowers initial performance, but the testing of all problems after the practice improves (Bowen, 2012). The twenty decisions of Fingame may be initially overwhelming, as concepts are taught throughout the course. However, formal final reports on FinGame assure one that learning has approached mastery. In FinGame, students have attempts (quarterly decisions) with feedback (financial statements) at improving an outcome (stock price). The motivation of gamifying the course is to improve on the mastery process.

Gamification

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Michael Jordan has stated, “I’ve missed more than 9000 shots in my career. I’ve lost almost 300 games. 26 times, I’ve been trusted to take the game winning shot and missed. I’ve failed over and over and over again in my life. And that is why I succeed.”

What is gamification? Is it winning? Is it the competition? Gamification is putting elements from games into the learning paradigm. The color, the action, the rules, the trial and error, and the experience are there for an outcome. The motivation is being successful in a challenge. How one gets there is in the design. Designing games with “playful challenges” and principles of human error has improved player experience (Battaiola, 2016). The *Mario Brothers* game brings on new features by having a separate area apart from the game to practice the feature. Then, the new feature is embodied in the game. This is a critical step toward mastery.

Why gamification? It may have started seeing a computer hand trucked into my math classroom in 1976. It was a black and white monitor with keyboard on top of a metal box the size of a kitchen trash can. The games – a ping-pong game and a bowling game. We are teaching students who grew up with video games. The debate about who uses the games is for another. However, Walter argued that those who played are “in-demand” professionals. He connects the arrival of videos games and “Gen Y” and presents metrics on the “gamer” (Walter, 2012). The increased use of gamification in higher education since 2010 is documented. de Souza et al. (2018) find positive responses to the applications of gamification with limits (de Souza Vieira, Peixoto Saibert, Neto, Mota da Costa, & de Souza Paiva, 2018).

FinGame and Corporate Finance

FinGame is introduced with an assignment named FinGame Prep to create a reference sheet. I purposely did not grade the assignment for the first run of the FinGame Simulation. This is from experience in adding new things to courses. This will be a graded assignment for the next course. We connect the game to corporate finance and the FinGame Online 5.0: The Financial Management Decision Game Participant’s Manual (Brooks L. , 2008) with an exercise to identify the input decisions.

Table 1

FinGame Input Decisions

- Advertising
- Buy back common stock
- Buy back preferred stock
- Issue common stock
- Issue preferred stock
- Marketable security risk
- Pay dividends
- Produce units
- Project A
- Project B
- Purchase forecasts
- Sales discount
- Short-term loans
- Tender common stock
- Ten-year bonds
- Three-year loans
- Trade marketable securities
- Two-year loans
- Unit price
- Units of machinery
- Units of plant

Students are asked to identify the activity area (operations, investing, or financing) as seen in Figure 1. The next task is to identify on which financial statement the item is located on. Then, students are required to find the page or pages in the participant’s manual to reference. Thus, they create a tip sheet.

Figure 1

Image from FinGame Prep exercise.

Activity	Statement	Participants Manual
Operations (O)	Performance or Income Statement (IS)	Page Number(s) to Refer to
Investing (I)	Position or Balance Sheet (BS)	
Financing (F)	Statement of Cash Flows, (CF)	

The following questions are asked which relate to financial management:

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By looking at a Fingame company balance sheet (page 47) how can one identify its form of business organization?

What should be one's goal in managing one's Fingame company (search the document)?

Next, one continues with an analysis question.

What is the book value of equity (common stock) and the market value of equity per share for the Fingame company on pages 47 and 48? Calculate the market value of equity (the market cap).

Several questions on operating, investing, and financing activities are asked.

Table 2

Activity Questions

Operating Activities

What is the optimal or target cash balance? Page Number ()

What are marketable securities?

What is the cost of purchasing material? Page Number ()

What is the cost of labor? Page Number ()

What is the cost of carrying inventory (storing)?

Investing Activities

Identify the long-term investment decisions that are available in Fingame. Page Number ()

Why are the long-term investment decisions needed?

What is the life of each of these possible long-term investments?

Financing Activities

What are the five types of loans (debt)?

What are the interest rates for the debt types for next quarter?

Convert those interest rates to annual by multiplying by the four (4) to get the annual rate?

Which loan's interest rate seem exorbitant? How do you avoid this loan?

What are the types of equity that you can issue?

What are the costs to issue equity type?

The next step is a short video presentation on operating the FinGame company. It covers the following steps from the participant's manual.

Figure 2

FinGame Company Operating Procedure (Steps 6 through 9)

6. “Edit Pro Forma Decision Inputs” allows preparation of budgeted or estimated statements that are generated from the company’s current financial position based on the manager’s forecasts of estimated units of product demanded, estimated interest rates for the coming period, and the remaining set of company operating, investment, and financing decisions. When completed, execute “Save Changes” for them to be retained. Details on preparing sound pro forma statements are in Chapter 3.

7. The “Run Pro Forma Simulation” option is used to generate the Pro Forma financial statements and summary data based on the preceding step.

8. “View Pro Forma Results” enables the viewing of the simulated information for the current and all prior completed company quarters generated in step 7. The results contain information similar to Exhibits 4.1, 4.2, and 4.3 in Chapter 4. Only the most recently simulated set of pro forma statements generated will be retained. A prior set of Pro Forma statements will be overwritten whenever a new pro forma simulation is run. The last Pro Forma run before the actual quarter run is retained in each company’s history file and can be viewed on all prior quarters and the current quarter.

9. Students can replicate steps 6 to 8 as often as they like. With an appropriate planning algorithm, the final plan should be achieved within two to four iterations of steps 6 to 8.

Next, one emphasizes the “manager’s forecasts of estimated units of product demanded, estimated interest rates for the coming period, and the remaining set of company operating, investment, and financing decisions.”

Used In class and recorded, a Pro Forma in an Excel™ spreadsheet is . Each ply contains

Table 3

Pro Forma Worksheet Plies

Sheet	Name	Description
1	Table of Sheets	
2	QUARTER01	Paste Quarter output into file
3	DECISIONS	Displays decisions

Table 3*Pro Forma Worksheet Plies*

Sheet	Name	Description
4	ProFormaDec	Displays decisions from Pro Forma input
5	Discount	Sales Discount
6	MarSec	Marketable Securities
7	Inventory	
8	Materials	
9	Labor	
10	Depreciation	
11	Overhead	
12	SAE	Sales and administrative expenses
13	AccPay	Accrued Payables
14	2yr	2-year loans
15	3yr	3-year loans
16	Bonds	
17	FinExp	Financing expenses (interest expenses)
18	Common	Common stock issue and repurchase
19	Preferred	Preferred stock issue and repurchase
20	Machinery	
21	Plant	
22	IS	Pro Forma income statement
23	BS	Pro Forma balance sheet
24	CB	Pro Form Cash budget.

a worksheet to illustrate how it affects the IS, BS, and CB (See Table 3).

For illustration, observe the Discount ply in Figure 3 Panel A; it evaluates a discount. Is it worth taking the discount to get more funds or just borrowing at the short-term rate to get the funds?

Students are then shown *Solver*, and how to use it to find a solution to the question. In this case, with the assumption of 10% additional cash, the discount given is much greater than the interest cost of borrowing the funds. The other sheets are similar.

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Figure 3

Discount sheet

Panel A

Spreadsheet ply on evaluating

Sales discounts			
	Found In		
Sales Forecast	IFQ	105,721	units
Price	DEC	\$ 99.81	
Sales revenue	IS, DEC	\$ 10,552,013	
Changes in Cash Sales		10%	Changing Cell
Cash Sales % w/o discount		33%	
Cash Sales % with discount		36.3%	
Discount		1%	
Revenues		\$ 10,552,013	
Discount amount		\$ 38,304	
Gain in cash		\$ 309,913	
Interest Rate		2.87%	
Cost of borrowing gain		\$ 8,885	
Indifference		\$ 29,419	Objective: Zero

Panel B

Showing formulas

Sales discounts			
	Found In		
Sales Forecast	IFQ	=QUARTER01!B207	units
Price	DEC	=ProFormaDec!C12	
Sales revenue	IS, DEC	=PRODUCT(C3:C4)	
Changes in Cash Sales		0.1	Changing Cell
Cash Sales % w/o discount		0.33	
Cash Sales % with discount		=33%*(1+C7)	
Discount		0.01	
Revenues		=C5	
Discount amount		=C9*C10*C11	
Gain in cash		=(C9-C8)*C11-C12	
Interest Rate		=QUARTER01!A251	
Cost of borrowing gain		=C13*C14	
Indifference		=C12-C15	Objective: Zero

Set Objective:

To: Max Min Value Of:

By Changing Variable Cells:

Subject to the Constraints:

Panel C

Solver input to see net value of discount

Gamifying

The purpose of gamifying the Corporate Finance course was to deliver the output of the FinGame in a dashboard framework and add elements of games to the course. One will use the FinGame tracker spreadsheet to illustrate the before and after affects. Gamification to the FinGame output consisted of adding color, “Go To” buttons on each sheet, use of Excel Sparklines, and a style guide. In Appendix A there is a screen image of the FinGame 5.0 output. It is as one of my students stated, “a lot of stuff.” It is a data that is will copy and paste to a text editor, WORD, or EXCEL. We created a spreadsheet that presents the concepts, which we titled Fingame Tracker.

Buttons

In Figure 1, the concepts and elements in a Table of Contents are organized. To assist in the navigation, macro enabled buttons and “Go to” buttons were created. The macro enabled buttons are used to open the necessary sheets, and keep the others hidden (Figure 5). The “Go to” buttons are attached with a hyperlink that will go to the sheet (Figure 6). The open all button opens all sheet. The reset button does not reset the worksheets but merely sets the visible sheets to that are shown at the beginning.

FinGame Tracker

The tracker spreadsheet requires a copy and paste of the quarterly output. In Appendix A, the first parts of the output are produced. The output contains the quarterly decisions, the income statement, the balance sheet, a summary of return metrics, and the information for future quarters. The tracker calculates relevant metrics of capital budgeting, capital structure, market demand, and production operations, and meetings.

Figure 5

Button macro for Session 2

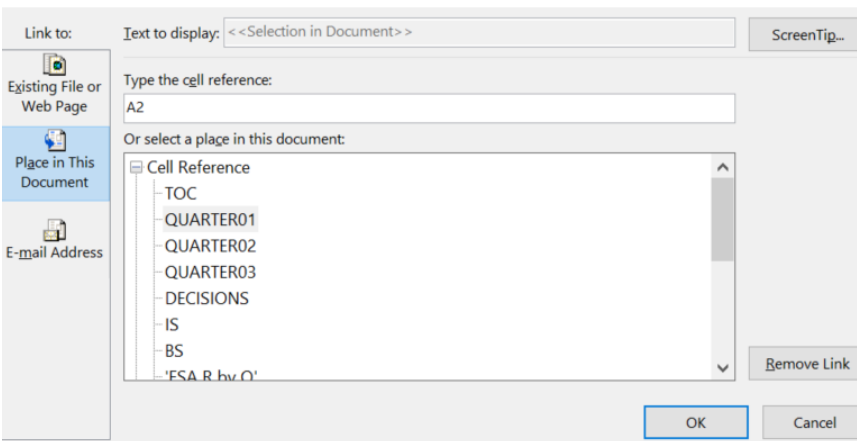
```

Sub Session2()
' Session2 Macro
.

    Call OpenAll
    Call ResetAll
    Rows("15:20").Select
    Range("B15").Activate
    Selection.EntireRow.Hidden = False
    Sheets("TOC").Select
    Sheets("FSA R by Q").Visible = True
    Sheets("FSA Q by R").Visible = True
    Sheets("FCF").Visible = True
    Sheets("DEBT").Visible = True
    Sheets("WACC").Visible = True
    Sheets("PROJECTS").Visible = True
    Sheets("QUARTER01").Select
    Sheets("TOC").Select
    Range("B1").Select
End Sub
    
```

Figure 6

Button hyperlink to go to a cell in a ply



The tracker was demonstrated in the beginning of the course. Midway through the game, students met with the instructor and used the tracker to discuss strategy for the rest of the game. At the

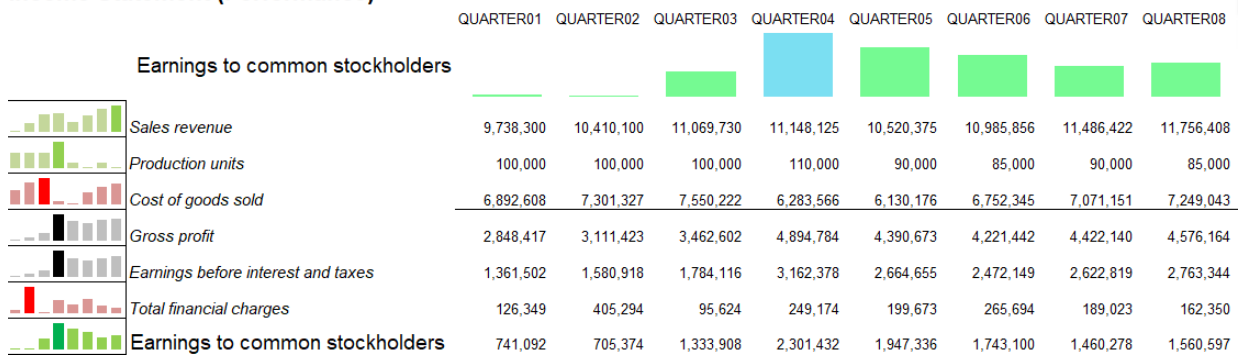
end of the game, students’ trackers were discussed via email and Microsoft Teams. Tracker has dashboards.

Dashboarding

The use of the dashboard is to have data and graphics communicate important details. Excel’s Sparklines is incorporated to enhance the presentation of the financial sheets. The Income statement (see Figure 7) is presented. The Sparkline feature allows color emphasis on negative data, positive data, and the highest or lowest data. Some components of the Income Statement are listed. In the class sessions, the professor asks questions to invoke thought, e.g. what is between Total finance charges and Earnings available to common stockholders. As this sheet was developed, the color scheme was simple costs in red, profit in black (profit) and red (loss), and green for revenue and equity accounts. This, however, contained some concepts that were not that simple. This led to the development of a style guide.

Figure 7

Income statement dashboard
Income Statement (Performance)



Style guide

A style guide established the font and color choices in Figure 8. Each sheet has color and font selection to emphasize the learning content of the sheet. The font choices are set to rank the information on a given sheet: big, medium, and small. The zoom is set to 100° on all sheets, to ensure consistency between viewing them, as zoom is saved to the file directly.

For the Quarter color pallet (Figure 8 Panel B), warm colors are used to promote action, energy. These are the parts of the assignment that deal with direct involvement from the students. These colors have an absolute brightness value that increases as the sessions progress to continuously draw more attention. It ends on yellow, which is the most attention-grabbing color.

The two sets of colors are optimized for whether white or black text is displayed on top of them. If colors are used for coloring text on a white background, we use the darker version. For the data color pallet (Figure 8 Panel C), these colors were chosen as they contrast with each other nicely. These colors are chosen over the standard bright colors that Excel has by default as they tend to be far too saturated and startling. This will be much more palatable over a whole semester if a student makes a mistake.

Figure 8

Style Guide font and colors

Panel A

Font formatting

Titles - Arial Bold 16pt

Big - Arial Regular 14pt

Medium - Arial Italic 11pt

Small - Arial Regular 10pt

Panel B

Quarter Color Pallet

■ #F15F61	■ #961F1F	■ Quarter 1
■ #F16261	■ #AF2725	■ Quarter 2
■ #F37061	■ #B83627	■ Quarter 3
■ #F47E60	■ #BB4527	■ Quarter 4
■ #F89C5E	■ #CB6928	■ Quarter 5
■ #FCB556	■ #DF8F26	■ Quarter 6
■ #FFC94A	■ #EFB11F	■ Quarter 7
■ #FEDD4F	■ #E5C021	■ Quarter 8

Panel C

Data Color Pallet

■ #F15F61	Bad
■ #75FA92	Good
■ #7BDFF2	Best

Elements of games

Panel D

Sheets Color Pallet

#A4DDEF	■	#5FCEE0	■	Decisions
#9D8DBA	■	#54038A	■	Income Statement
#9D8DBA	■	#54038A	■	Balance Sheet
#D6E9C3	■	#75FA92	■	FSA Q by R
#D6E9C3	■	#75FA92	■	FSA R by Q
#BCE6F5	■	#7BDFF2	■	Free Cash Flow
#D6E9C3	■	#75FA92	■	Debt
#D0CBE5	■	#8B85C1	■	WACC
#D0CBE5	■	#8B85C1	■	Projects
#BCE6F5	■	#7BDFF2	■	Demand
#BCE6F5	■	#7BDFF2	■	Market
#C5E6E0	■	#6CDCBC	■	Report
#C5E6E0	■	#6CDCBC	■	CashMgmt
#C5E6E0	■	#6CDCBC	■	CapBud
#C5E6E0	■	#6CDCBC	■	Production
#C5E6E0	■	#6CDCBC	■	Pricing
#C5E6E0	■	#6CDCBC	■	Capital

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On the spreadsheet plies (Figure 8 Panel D), the colors are shades of green and blue commonly used in business to represent growth and innovation. These colors were chosen to invoke a feeling of experimentation and exploration and encourage students to pursue what's inside these sections.

FinGame 5.0 is a game. Reports of quarterly standings of the FinGame companies were produced. The purpose was to motivate and encourage competition among the students. Reports included stock price, accumulated wealth, return on investment, return on equity, and earnings per share. The reports used Excel's conditional formatting to present a gradient of color on the value each item. These reports were sent out via the learning management system's announcements (and email).

Implementation

The use of the FinGame simulation was first used in the MBA program during a Summer term Corporate Finance course. A report of the student experience was used for a grade. The performance of the companies was only 20% of the grade. That proportion was scaled from zero to 20; scores above 10 were for companies that kept the stock price the same as it was to start the game, and 20 was for the highest stock price above the starting point.

The course has eight Microsoft Teams 4-hour sessions meeting through 14 weeks. FinGame was introduced with preliminary assignments and in the use of creating Pro Forma statements. Most student companies manage to get increases in stock prices through the first four quarters of the simulation. In the setup of the simulation, demand was increased over the eight quarters. The instructor I meet with students midway through the game to individual discuss their FinGame tracker. Two comments were interesting: the FinGame Participant's Manual was "wordy," and, "I did not notice the Penalty loan." Students had difficulty with cash management and production capacity in the last four quarters.

A short survey was conducted concerning what the students' impressions were and how the simulation benefited students enrolled in the course (see Table 4). Seven of 13 checked "Got to apply

concepts from the course.” However, four of the 13 students checked “I don’t know.” This was not unexpected, as previous implementation of a simulation in the Capstone MBA course produced a similar response.

Table 4

Survey responses

How do you feel the simulation benefited the course? Check all that apply.

Choices	Responses
Made coursework more beneficial	3/13
Got to apply concepts from the course	7/13
Simplified coursework	2/13
I don’t know	4/13

Conclusions

The use of gamifying concepts was used with the FinGame simulation. I cannot answer the question as to why FinGame has not been updated to include dashboards that we see in other simulations. That was my motive in creating the tracker spreadsheet. The metrics relevant to Corporate Finance were added with dashboards. The market reports were used to add the element of competition and motivation. The first implementation was overwhelming to students. Having the expectation of the game in future courses will improve responses.

Appendix A

FinGame 5.0 output

Results for company name: OS Copr.

Decision Inputs for Quarter Number 1

Company Operating Decisions

Units to be produced	100,000	Per unit price	\$100.00
Div. per common share	\$0.10	Advertising cost	\$0
Demand/price forecast	\$0	Sales discount	0.00%

Investment Decisions

Short-term investment	\$200,000	Risk of S-T investment	0
Machine units bought	0	Units of plant bought	0
Project A	no	Project B	no

Financing Decisions

Short-term loans	\$0	Preferred shares	0
Two-year loans	\$2,500,000	Common shares	0
Three-year loans	\$0	Common tender price	\$0
Ten-year bonds	\$0		

Special Options

Strike settlement (per hr.)	\$0.00	Dollar penalty	\$0
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Quarterly Performance Report

Quarter Number 1

Sales revenue (97,383 units at \$100.00)	\$9,738,300	
Income from securities	<u>2,725</u>	\$9,741,025

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Appendix A

FinGame 5.0 output

Cost of Goods Sold:		
Beginning Inventory: (9,809 at \$74.79)		\$733,567
Materials	\$1,500,000	
Direct Labor	<u>3,500,000</u>	
Total Direct Costs		\$5,000,000
Warehousing Costs	\$60,408	
Depreciation: Mach. and Equip.	478,125	
Plant	1,300,000	
Other Overhead Costs	<u>200,000</u>	
Total Indirect Costs		<u>2,038,533</u>
Production Costs (100,000 at \$70.39)		<u>7,038,533</u>
Goods Available for Sale (\$70.78 per unit)		\$7,772,100
Less: Ending Inventory (12,426 units)		<u>879,492</u>
Cost of Goods Sold		<u>6,892,608</u>
Gross Profit		\$2,848,416
Selling and administrative expenses		\$1,486,915
Financial Expenses:		
Short Term Bank Interest	\$0	
Penalty Loan Interest	0	
Intermediate Term Loan Interest	92,749	
Bond Interest	33,600	
Bond Redemption Costs	<u>0</u>	
Total Financial Charges		<u>126,349</u> <u>1,613,264</u>
Operating Income Before Extraordinary Items		\$1,235,153
Extraordinary Items		<u>0</u>
Income Before Taxes		\$1,235,152
Income Tax (rate is 40%)		<u>494,060</u>
Income After Taxes		\$741,092
Preferred Stock Dividend		<u>0</u>
Earnings to Common Stockholders		\$741,092
Common Stock Dividends (\$0.10 per share)		<u>100,000</u>
Net Income Transferred to Retained Earnings		<u>\$641,092</u>

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