

Private Company Valuation Model

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Abstract

In this project, I created an automated private company valuation model, aiming to streamline and expedite a time-consuming and complex process. The problem addressed is the reliance on manual calculations, data collection, and subjective judgment in private company valuation, leading to inefficiency and potential errors. The development of the automated private company valuation mode addresses the inefficiencies and subjectivity inherent in traditional manual valuation processes. The project streamlines the valuation process by integrating multiple valuation methods, such as Backsolve Option Pricing, Discounted Cash Flows, and Comparative Analysis, into a comprehensive Excel-based model. By automating data collection and calculation processes, the model reduces valuation time from days to hours while ensuring reliability and accuracy. This project offers investors, decision-makers, and strategic planners a reliable tool to assess the value of private companies efficiently.

Introduction

A private company valuation seeks to put a value or price on a company that is not publicly traded by looking at different characteristics of the company and comparing it to similar companies. Precision and efficiency in completing a valuation are crucial for investors, venture capitalists, and business owners. In this project, I develop an automated Excel model with macros to streamline valuation procedures, saving time and maintaining accuracy. The goal was to allow users to focus on critical aspects of valuation while minimizing repetitive tasks.

My choice to pursue this project stemmed from practical experiences and future goals. Through a summer internship, I witnessed how automation can significantly improve organizational performance in valuation. I was driven by the prospect of enhancing competitiveness and margins through improved efficiency, aspiring to become proficient in financial modeling for future roles.

Despite the stereotype, there's ample opportunity for computer scientists to innovate in financial modeling. The integration of advanced technologies with financial analysis presents a promising frontier for optimization and innovation. By embracing this intersection, we can not only improve financial modeling practices but also expand computing applications, contributing to broader advancements.

In summary, this project addresses immediate needs in private company valuation while aligning with my personal and professional aspirations. By leveraging automation and computational techniques, it pushes the boundaries of innovation and efficiency in both financial modeling and the broader field of computing.

Background

Private company valuation is a critical process in the financial sector, as it provides the foundation for investment decisions, merger and acquisition strategies, and overall financial planning. There are some big differences in valuing public and private companies. Public companies, the ones you see listed on stock exchanges, have their values determined by how much people are willing to pay for their shares. This price is influenced by a bunch of factors, like how well the company is doing, what people expect it to do in the future, and what's happening in the economy overall. Private companies, on the other hand, don't have their shares traded on public exchanges, so figuring out how much they're worth is trickier. It involves digging into their financial records, looking at how similar companies are valued, and predicting future earnings. Both types of valuations involve a lot of factors, like how much money the company is making or expected to make, how risky it is to invest in them, and how similar companies are priced. It's like trying to put together a puzzle with lots of different pieces, and each piece helps give us a clearer picture of the company's value.

Traditionally, private company valuations have been conducted manually, relying on a combination of financial data analysis, subjective judgment, and various valuation methods. This manual approach has often proven to be time-consuming, error-prone, and lacking standardization. Therefore, there is a growing need to develop an automated and comprehensive model for private company valuation.

The valuation of private companies typically involves multiple methods, including:

1. Backsolve Option Pricing Method: This approach calculates a company's value by working backward from the price of a financial option, such as a call option, which gives the right to buy shares at a predetermined price, using complex mathematical models [1].
2. Discounted Cash Flows (DCF): This method estimates a company's value by forecasting its future cash flows and then discounting them back to their present value, considering the time value of money and the risk associated with those cash flows [2].
3. Comparative Analysis: This method assesses a company's value by comparing it to similar companies in the same industry, typically using multiples like price-to-earnings ratio or enterprise value-to-EBITDA ratio to determine relative valuation [3].

These methods offer a holistic view of a company's value by considering different financial and market factors. However, the complexity of these methods and the need for precise data inputs have made manual valuation an intricate and often laborious task.

Several software tools and applications have been developed to assist with business valuation and financial modeling. A few of them include financial research platforms like Bloomberg Terminal, Capital IQ, FactSet, and Morningstar Direct, valuation software like ValueAdder and BizEquity, and other primary accounting software that has valuation features like QuickBooks. However, financial research platforms are often tailored for public companies, and Valuation software tailored to private companies like ValueAdder can be very costly and does not adequately address the unique challenges associated with valuing private companies, which often have limited data available and unique ownership structures.

The choice of Excel and VBA as the primary tools for this project is rooted in the familiarity of financial professionals with these tools. Private company valuation practitioners often work with Excel-based financial models, and using these tools ensures that the solution will be user-friendly and easily modifiable to meet specific needs.

In summary, this project builds upon the existing practices in private company valuation, recognizing the limitations of manual methods and the need for automation to increase

efficiency, accuracy, and accessibility. By creating an Excel-based valuation model that leverages various valuation methods and data sources, this project strives to make private company valuation more accessible, reliable, and efficient.

Methodology

My project employs a structured methodology to develop an Excel-based automated valuation model for private companies. Below is a detailed explanation of the methodology, including the intended approach, significant changes made during implementation, and justification of technical choices.

1. **Software Development Environment Setup:** Initially, the project intended to utilize the FactSet-Excel plugin for data retrieval. However, due to subscription limitations restricting access to specific computers, an alternative approach was adopted. The development environment was set up with Excel and VBA, ensuring compatibility and accessibility across different platforms. Video tutorials, such as the Kroft Tutorials - FactSet Tutorial for Financial Applications and Data Analysis, by Bram van der Kroft, were utilized for guidance.
2. **Model Design and Framework Development:** The project focused on creating a user-friendly Excel-based valuation model framework that integrates multiple valuation methods. Emphasis was placed on automation and intuitive user interface design. Resources like the FinRow Academy YouTube channel provided valuable insights into Excel modeling techniques.
3. **Research and Data Collection:** Comprehensive research was conducted to gather data on various private company valuation methodologies, including Backsolve Option Pricing, Discounted Cash Flows, and Comparative Analysis. Access to relevant financial data sources was ensured to facilitate accurate valuation calculations. See references [4], [5], and [6].
4. **Valuation Method Integration:** The selected valuation methods were implemented within the Excel model, with careful consideration given to accurate calculations and seamless transitions between methods. This involved extensive testing and validation to ensure the reliability of results.

5. **Data Input Streamlining:** Efforts were made to streamline data input processes within the model, exploring options for incorporating Excel plugins to simplify and standardize data entry. Compatibility with common data formats was a key consideration.
6. **Model Testing and Debugging:** Rigorous testing was conducted to validate the accuracy, reliability, and efficiency of the valuation model. Any errors or inconsistencies identified during testing were promptly addressed and rectified.
7. **User Training Materials:** Comprehensive training materials and documentation were prepared to guide users on effectively utilizing the Excel-based valuation model. This included user guides, tutorials, and potentially video demonstrations for enhanced understanding.
8. **Deployment and Accessibility:** The finalized Excel-based valuation model was made accessible to users, potentially through the project owner's portfolio website. Efforts were made to ensure ease of download and access for users across different platforms.

Throughout the project, adaptability and flexibility were key principles guiding the methodology, allowing for adjustments to be made in response to encountered challenges and evolving project requirements. The chosen approach prioritized user needs, accuracy, and efficiency, culminating in the development of a robust Excel-based valuation model for private companies.

Usability

The model includes comprehensive written user instructions and an instructional video demonstrating its usage. However, a basic understanding of financial modeling and Excel is still necessary for effective utilization. The use of blue numbers to indicate input fields significantly aids users in understanding how to interact with the model. Additionally, the model performs background tasks to enhance user experience, minimizing the need for manual intervention. One notable feature is its compatibility across different machines with Excel installed. However, it should be noted that the macros have not been extensively tested on platforms other than Mac.

Henriette, selected as the tester due to her expertise in company valuations, provided valuable insights during user testing. Despite initial questions about the model's functionality, she quickly grasped its intricacies. Henriette found the blue numbers particularly helpful as they drew her

attention to input fields, facilitating accuracy. However, she required guidance on accessing comparable companies from financial databases, which was a novel process for her.

Henriette praised the inclusion of macros and was particularly impressed by the complexity of the Backsolve feature. Furthermore, she identified areas for improvement, notably in valuation practices such as the calculation of common share price, which should utilize the Option Pricing Model consistently across all valuation methods. This discrepancy serves as a quick fix for future iterations.

Most of Henriette's feedback pertained to visual enhancements. She suggested the inclusion of dollar signs in table headers and better highlighting of important values, such as the common stock price, to improve readability. Additionally, she recommended refining the visual layout of the summary page for better comprehension.

Overall, the user testing proved highly successful, with Henriette quickly grasping the model's functionality. Future iterations will focus on addressing her feedback, particularly regarding visual enhancements and consistency in valuation practices.

Impacts

The development and deployment of the automated valuation model for private companies carry both potential benefits and risks. While the project aims to streamline valuation processes and enhance efficiency, there are potential unintended consequences and risks to consider. These include the possibility of errors in valuation calculations, which could lead to inaccurate financial decisions and investment outcomes.

Ethical considerations are paramount, particularly concerning data privacy and confidentiality. The project must ensure that sensitive financial information is handled securely and ethically, with proper consent obtained from stakeholders. Moreover, the broader implications for stakeholders and society include the potential for increased transparency and fairness in financial decision-making, aligning with ethical principles and societal values of accountability and integrity.

Reflecting on the project's overall impact, it has the potential to empower stakeholders by providing them with valuable tools for informed decision-making. By streamlining valuation processes and improving accuracy, the project contributes to efficiency gains and may lead to better allocation of resources.

Results

The Excel-based automated valuation model developed for private companies has a structured methodology, and the project successfully integrated multiple valuation methods into a user-friendly framework emphasizing accuracy, efficiency, and accessibility. The Excel model offers comprehensive functionality for private company valuation, incorporating valuation methodologies such as Backsolve Option Pricing, Discounted Cash Flows, and Comparative Analysis. The user interface is designed to streamline data input processes while providing intuitive navigation for users of varying expertise levels.

I will now go over the sheets in the valuation Model and their purpose:

The “Assumptions Sheet” lets you input a few key assumptions that are used later in the valuation. Formatting and text visuals change based on some of these assumptions while numbers flow into calculations.

Bike Shop Assumptions Table	
Company Name	Bike Shop
Valuation Date	12/31/23
LTM Financials Date	12/31/23
Tax Rate	25.65%
Last Historical Year	2023
Company Intrest Rate	7.00%
Time to Maturity	5
Asset Schedule	No
Valuation Lead	Hannah Saethereng

The “Cap Table” sheet is where the user enters the company Capitalization Table. This flows into the Backsolve Option Pricing Model.

Bike Shop Cap Table									
Security Type	1	1	1	2	3	3	3	3	3
Security Name	Series A	Series A-1	Series B	Common	\$1.5 Options	\$2.75 Options	\$3.5 Options	\$4 Options	\$4.01 Options
Date	2/3/20	4/5/21	6/20/23	N/A	N/A	N/A	N/A	N/A	N/A
Share Price	\$1.00	\$2.00	4.50	\$0.00	\$1.50	\$2.75	\$3.50	\$4.00	\$4.01
Shares Outstanding	600,000	800,000	1,000,000	1,000,000	200,000	250,000	50,000	30,000	180,000
Seniority	2	1	1	N/A	N/A	N/A	N/A	N/A	N/A
Liquidation Preference	2.00x	1.00x	1.00x	N/A	N/A	N/A	N/A	N/A	N/A
Conversion Ratio	1.00x	1.00x	1.00x	1.00x	1.00x	1.00x	1.00x	1.00x	1.00x
Participation	N	N	N	N/A	N/A	N/A	N/A	N/A	N/A
Participation Cap	N	N	N	N/A	N/A	N/A	N/A	N/A	N/A
Cap	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cumulative Dividend	N	N	N	N/A	N/A	N/A	N/A	N/A	N/A
Dividend Rate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Underlying Security Number	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Shares when Converted	600,000	800,000	1,000,000	1,000,000	200,000	250,000	50,000	30,000	180,000
Money \$	600,000	1,600,000	4,500,000	-	300,000	687,500	175,000	120,000	721,800
Total Shares Outstanding	4,110,000								
Value \$	8,704,300								
Liquidation Preference	1,200,000	1,600,000	4,500,000	-	-	-	-	-	-
Conversion Shares	600,000	800,000	1,000,000	-	-	-	-	-	-
Participation Cap	-	-	-	-	-	-	-	-	-
Dividend	-	-	-	-	-	-	-	-	-
Option Proceeds	-	-	-	-	300,000	687,500	175,000	120,000	721,800
Conversion Price	\$2.00	\$2.00	\$4.50	\$0.00	\$1.50	\$2.75	\$3.50	\$4.00	\$4.01

The “Income Statement” sheet and the “Balance Sheet” sheet are where the user inputs the company’s financials and can alter projections to better reflect the specific company being valued.

Bike Shop Income Statement										
	Historicals			Forecasts					12/31/23	
	2021	2022	2023	2024	2025	2026	2027	2028	LTM	NTM
Revenue	400,000	350,000	460,000	604,571	794,580	1,044,305	1,372,515	1,803,876	460,000	604,571
COGS	0	40,000	80,000	105,143	138,188	181,618	238,698	313,718	80,000	105,143
Gross Income	400,000	310,000	380,000	499,429	656,392	862,686	1,133,816	1,490,159	380,000	499,429
Operating Expenses	174,000	218,000	300,000	394,286	518,204	681,068	895,118	1,176,441	300,000	394,286
EBITDA	226,000	92,000	80,000	105,143	138,188	181,618	238,698	313,718	80,000	105,143
Depreciation	8,000	8,500	9,000	12,757	17,573	23,796	31,884	42,433	9,000	12,757
Amortization	0	0	0	0	0	0	0	0	0	0
EBIT	218,000	83,500	71,000	92,386	120,615	157,822	206,814	271,284	71,000	92,386
Intrest Expense	0	0	0	0	0	0	0	0	0	0
Other Expenses	0	50	100	100	100	100	100	100	100	100
Taxes	0	0	0	23,671	30,912	40,456	53,022	69,559	0	23,671
Net Income	218,000	83,450	70,900	68,615	89,603	117,266	153,692	201,625	70,900	68,615
	2021	2022	2023	2024	2025	2026	2027	2028	LTM	NTM
Revenue Growth Rate	#DIV/0!	-12.5%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%		31.4%
COGS as % of Revenue	0.0%	11.4%	17.4%	17.4%	17.4%	17.4%	17.4%	17.4%	17.4%	17.4%
Gross Income Growth Rate	#DIV/0!	-22.5%	22.6%	31.4%	31.4%	31.4%	31.4%	31.4%		31.4%
OpEx as % of Revenue	43.5%	62.3%	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%
EBITDA	#DIV/0!	-59.3%	-13.0%	-31.4%	-31.4%	31.4%	31.4%	31.4%		-31.4%
Dep as % of PP&E	10.9%	17.3%	13.1%	13.1%	13.1%	13.1%	13.1%	13.1%	13.1%	
EBIT	#DIV/0!	-61.7%	-15.0%	-30.1%	-30.6%	-30.8%	-31.0%	31.2%		-30.1%
Net Income Growth Rate	#DIV/0!	-61.7%	-15.0%	3.2%	-30.6%	-30.9%	-31.1%	31.2%		3.2%

Bike Shop Balance Sheet									
	Historicals			Forecasts					12/31/23
	2021	2022	2023	2024	2025	2026	2027	2028	LTM
Assets									
Cash	-	11,063	30,794	91,241	171,037	276,220	414,733	597,017	30,794
Accounts Receivable	-	-	-	-	-	-	-	-	-
Inventory	-	5,624	2,000	2,629	3,455	4,540	5,967	7,843	2,000
Other Current Assets	-	21,537	20,937	27,517	36,165	47,532	62,470	82,104	20,937
Total Current Assets	-	38,224	53,731	121,387	210,657	328,293	483,171	686,964	53,731
PP&E	73,500	48,996	68,646	97,300	134,032	181,501	243,189	323,655	68,646
Goodwill	-	-	-	-	-	-	-	-	-
Other Intangible Assets	-	-	-	-	-	-	-	-	-
Other Assets	-	-	-	-	-	-	-	-	-
Total Long-Term Assets	73,500	48,996	68,646	97,300	134,032	181,501	243,189	323,655	68,646
Total Assets	73,500	87,221	122,378	218,687	344,689	509,794	726,360	1,010,619	122,378
Liabilities and Shareholders' Equity									
Accounts Payable	-	6,407	35,067	46,088	60,573	79,610	104,630	137,514	35,067
Accrued Liabilities	-	-	-	-	-	-	-	-	-
ST Debt	-	-	-	-	-	-	-	-	-
Other Current Liabilities	-	13,685	53,053	69,727	91,641	120,442	158,295	208,045	53,053
Total Current Liabilities	-	20,092	88,120	115,815	152,213	200,052	262,925	345,559	88,120
Long-Term Debt	69,295	63,504	63,416	63,416	63,416	63,416	63,416	63,416	63,416
Other Long-Term Liabilities	-	-	-	-	-	-	-	-	-
Total Long-Term Liabilities	69,295	63,504	63,416	63,416	63,416	63,416	63,416	63,416	63,416
Total Liabilities	69,295	83,596	151,536	179,230	215,629	263,468	326,341	408,975	151,536
Total Equity	4,206	3,625	(29,158)	39,457	129,060	246,326	400,018	601,644	(29,158)
Total Liabilities and Shareholders' Equity	73,500	87,221	122,378	218,687	344,689	509,794	726,360	1,010,619	122,378

The “Cash Flow” sheet shows the projected cash flows of the company and is calculated based on income statement and balance sheet values.

Bike Shop Cash Flow Statement

	Forecasts				
	2024	2025	2026	2027	2028
Cash Provided (used) by Operations					
Net Income	68,615	89,603	117,266	153,692	201,625
Depreciation	12,757	17,573	23,796	31,884	42,433
Amortization	0	0	0	0	0
Change in Working Capital	20,486	26,924	35,386	46,508	61,125
Decrease (increase) in Receivables	0	0	0	0	0
Decrease (increase) in Inventories	-629	-826	-1,086	-1,427	-1,875
Decrease (increase) in Other Current Assets	-6,580	-8,648	-11,366	-14,939	-19,634
Increase (decrease) in Accounts Payable	11,021	14,485	19,037	25,020	32,884
Increase (decrease) in Accrued Liabilities	0	0	0	0	0
Increase (decrease) in Other Current Liabilities	16,674	21,914	28,801	37,853	49,750
Cash Provided (used) by Operations	101,857	134,100	176,449	232,084	305,184
Cash Provided (used) by Investments					
Capital Expenditures	-41,411	-54,304	-71,265	-93,571	-122,900
Acquisitions	0	0	0	0	0
Other Investing Activities	0	0	0	0	0
Cash Provided (used) by Investments	-41,411	-54,304	-71,265	-93,571	-122,900
Cash Provided (used) by Financing Activities					
Additions (Reductions) to Short-Term Debt	0	0	0	0	0
Additions (Reductions) to Long-Term Debt	0	0	0	0	0
Dividends (Paid)	0	0	0	0	0
Cash Provided (used) by Fin. Activities	0	0	0	0	0
Net increase (Decrease) in Cash	60,447	79,796	105,183	138,513	182,284
Beginning Cash Balance	30,794	91,241	171,037	276,220	414,733
Ending Cash Balance	91,241	171,037	276,220	414,733	597,017

The “Public Comps” sheet and the “Transaction Comps” sheet shows the Guideline Public Company Analysis and the “Comparable Transaction Analysis” The sheets also have macros that help the user switch between different approaches. The sheets get their data from a the “FactSet Public Comps” sheet and the “DealStats Transaction Camps” sheet.

“Public Comps” sheet:

										Bike Shop Guideline Public Company Analysis											
										Average		LTM EV/Sales		NTM EV/Sales		LTM EV/EBITDA		NTM EV/EBITDA			
										Median		Average		2.67x		0.96x		17.65x		7.23x	
										25th Percentile		Median		0.69x		0.74x		12.51x		6.12x	
										75th Percentile		25th Percentile		0.38x		0.33x		9.07x		5.67x	
												75th Percentile		1.71x		1.29x		21.57x		9.15x	
										Chosen Multiple		Chosen Multiple		0.69x		0.74x		12.51x		6.12x	
										Weight		Weight		2%		30%		50%		92%	
										Enterprise Value		Enterprise Value		\$95,406		\$309,302		\$1,315,816		\$3,698,872	
										Weighted Average EV		Weighted Average EV		\$2,507,344							
Bike Shop Guideline Public Company Analysis																					
Ticker	Exchange	Name	Market Value	Enterprise value	Price	Total Debt	EBITDA Margin	Sales LTM	Sales NTM	EBITDA LTM	EBITDA NTM	LTM EV/Sales	NTM EV/Sales	LTM EV/EBITDA	NTM EV/EBITDA						
DKS	NYSE	Dick's Sporting Goods	16247.8	19210.4	203.1	4263.8	13.63%	12994.4	13269.0	1789.7	1872.9	1.48x	1.29x	10.86x	9.15x						
ASO	NASDAQ	Academy Sports and Outdoor	4391.4	5740.2	59.0	1696.7	12.80%	6159.3	6303.1	798.3	823.3	0.93x	0.74x	7.28x	5.67x						
WSM	NYSE	Williams-Sonoma	18018.8	18647.4	288.9	1380.6	19.22%	7750.7	7785.8	1460.1	1546.3	2.41x	2.28x	12.51x	11.40x						
M	NYSE	Macy's	6203.4	10071.4	19.3	6342.0	8.41%	22666.0	22460.0	2246.0	1075.2	6.44x	6.33x	4.72x	3.76x						
WNA	NASDAQ	Winn-Dixie	1301.7	1261.7	343.6	73.4	65.28%	83.2	84.3	-	-	15.16x	11.1x	23.22x	17.1x						
BGFV	NASDAQ	Big 5 Sporting Goods	71.6	338.6	3.2	277.2	0.98%	864.7	870.1	7.6	-	0.38x	0.33x	44.82x	51.4x						
BNED	NYSE	Barnes & Noble Education	594.8	594.8	0.7	535.0	1.81%	1546.4	1620.0	28.1	-	0.36x	0.17x	19.85x	45.1x						
SUNF	NYSE OTC	SIGNA Sports	0.1	204.8	0.0	246.9	-	1148.0	-	-	-	0.18x	1.1x	-	6.12x						

	Average	Median	25th Percentile	75th Percentile
LTM EV/Sales	0.61x	0.55x	0.42x	0.81x
NTM EV/Sales	1.20x	0.87x	0.48x	1.89x
LTM EV/EBITDA	5.92x	4.15x	2.11x	6.09x
NTM EV/EBITDA	6.91x	3.20x	2.47x	9.49x
Chosen Multiple	0.61x	1.20x	5.92x	6.91x
Weight	0%	0%	50%	50%
Enterprise Value	\$48,467	\$554,132	\$622,053	\$4,174,893
Weighted Average EV	\$2,398,473			

“FactSet Public Comps” sheet:

Company	Fiscal	Market	Enterprise	Total	Sales	EBITDA EV/	EV/SALES	EV/	EV/EBITDA	Shares	Shares Out	Preferred	Accumulated Cash &							
Name	Ticker	Period	Exchange	Value	Value	Price	Debt	Sales	NTM	EBITDA	NTM	Sales (x)	NTM (x)	EBITDA (x)	NTM (x)	Outstanding	(Diluted)	Stock	Min Interest	ST Inv

“DealStats Transaction Camps” sheet:

Target SIC 1	Target NAICS 1	Target Type	Sale Date	Target Business Description	Net Sales	Operating Profit	EBITDA	SDE	MVIC Price	MVIC/Net Sales	MVIC/SDE	MVIC/EBITDA	Net Sales FY+1	EBITDA FY+1
	5941	459110 Private	05/31/2023	Outdoor Athletic Equipment Retailer	\$4,051,066	\$534,178	\$551,808	\$635,808	\$2,800,000	0.69x	4.4x	5.1x	\$1,482,028	\$177,497

The “Breakpoints” shows the company’s breakpoints after the backsolve macro has run.

Bike Shop Breakpoints											
	Debt	Debt	Debt	Debt	Debt	Debt	Debt	Debt	Debt	Debt	Debt
	receives their liquidation preference	receives its liquidation preference	Common starts participating	Series A converts	\$1.5 Options exercise	Series A-1 converts	\$2.75 Options exercise	\$3.5 Options exercise	\$4 Options exercise	\$4.01 Options exercise	Series B converts
Debt	63,416	63,416	63,416	63,416	63,416	63,416	63,416	63,416	63,416	63,416	63,416
Series A-1		1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	2,200,000	2,800,000	3,200,000	3,208,000	3,600,000
Series B		4,500,000	4,500,000	4,500,000	4,500,000	4,500,000	4,500,000	4,500,000	4,500,000	4,500,000	4,500,000
Series A		600,000	600,000	600,000	900,000	1,200,000	1,650,000	2,100,000	2,400,000	2,406,000	2,700,000
Common			-	1,000,000	1,500,000	2,000,000	2,750,000	3,500,000	4,000,000	4,010,000	4,500,000
\$1.5 Options					-	100,000	250,000	400,000	500,000	502,000	600,000
\$2.75 Options							-	187,500	312,500	315,000	437,500
\$3.5 Options								-	25,000	25,000	50,000
\$4 Options									-	300	15,000
\$4.01 Options										-	88,200
Breakpoint/Strikeprice	63,416	6,763,416	6,763,416	7,763,416	8,563,416	9,463,416	11,413,416	13,550,916	15,000,916	15,030,216	16,554,116
Stock Price	-	-	-	1.00	1.50	2.00	2.75	3.50	4.00	4.01	4.50
Total Common Shares	-	-	1,000,000	1,600,000	1,800,000	2,600,000	2,850,000	2,900,000	2,930,000	3,110,000	4,110,000
Value of Common Shares	-	-	-	1,600,000	2,700,000	5,200,000	7,837,500	10,150,000	11,720,000	12,471,100	18,495,000

The “Backsolve” sheet shows the Option Pricing Model used to calculate the value of a company after the backsolve macro is run.

Bike Shop Option Pricing Model Backsolve													
	Time 0	Debt	Series A-1 receives its liquidation preference	Common starts participating	Series A converts	\$1.5 Options exercise	Series A-1 converts	\$2.75 Options exercise	\$3.5 Options exercise	\$4 Options exercise	\$4.01 Options exercise	Series B converts	
Total Value/Strike Price/Breakpoint	-	63,416	6,763,416	6,763,416	7,763,416	8,563,416	9,463,416	11,413,416	13,550,916	15,000,916	15,030,216	16,554,116	
Spot Price	17,627,881												
Time to Maturity	5												
Risk free rate	4.04%												
Dividend Yield	0												
Implied Volatility	50%												
D1		5.77	1.60	1.60	1.47	1.39	1.30	1.13	0.98	0.88	0.88	0.80	
D2		4.66	0.48	0.48	0.36	0.27	0.18	0.01	(0.14)	(0.23)	(0.24)	(0.32)	
Call Value	17,627,881	17,576,069	12,876,255	12,876,255	12,336,202	11,929,703	11,497,455	10,642,721	9,817,123	9,313,698	9,303,911	8,818,411	
Differential	51,812	4,699,814	-	540,053	406,500	432,247	854,734	825,599	503,464	9,747	485,500	8,818,411	
Allocation Table (% allocation)													Number of shares
Debt	63,416												
Series A-1		1,600,000					800,000	800,000	800,000	800,000	800,000	800,000	800,000
Series B		4,500,000											1,000,000
Series A		600,000			600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
Common			1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
\$1.5 Options					200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
\$2.75 Options								250,000	250,000	250,000	250,000	250,000	250,000
\$3.5 Options									50,000	50,000	50,000	50,000	50,000
\$4 Options										30,000	30,000	30,000	30,000
\$4.01 Options											180,000	180,000	180,000
Total	63,416	6,700,000	1,000,000	1,000,000	1,600,000	1,800,000	2,600,000	2,850,000	2,900,000	2,930,000	3,110,000	4,110,000	
Allocation													Per share value
Debt	51,812	-	-	-	-	-	-	-	-	-	-	-	51,812
Series A-1	-	1,122,344	-	-	-	-	262,995	231,747	138,887	2,661	124,888	1,716,479	3,600,000 4.50
Series B	-	3,156,591	-	-	-	-	-	-	-	-	-	2,145,599	5,302,190 5.30
Series A	-	420,879	-	-	152,437	144,082	197,246	173,810	104,165	1,996	93,666	1,287,359	2,575,841 4.29
Common	-	-	-	540,053	254,062	240,137	326,744	289,684	173,608	3,327	156,109	2,145,599	4,131,324 4.19
\$1.5 Options	-	-	-	-	-	48,027	65,749	57,837	34,722	665	31,222	426,120	667,442 3.34
\$2.75 Options	-	-	-	-	-	-	-	72,421	43,402	832	39,027	536,400	692,082 2.77
\$3.5 Options	-	-	-	-	-	-	-	-	8,680	166	7,805	107,280	123,932 2.48
\$4 Options	-	-	-	-	-	-	-	-	-	100	4,683	64,368	69,151 2.31
\$4.01 Options	-	-	-	-	-	-	-	-	-	-	28,100	386,208	414,307 2.30
Total	51,812	4,699,814	-	540,053	406,500	432,247	854,734	825,599	503,464	9,747	485,500	8,818,411	17,627,881

The “WACC” sheet shows the calculation of WACC. And have two inputs the user will change according to the specific company.

Bike Shop WACC	
Risk Free Rate	4.04%
Beta	1.30
Equity Risk Premium	5.31%
CAPM	10.95%
Cost of Debt	7.00%
Debt to Asset	51.8%
Equity To Asset	48.2%
WACC	7.97%

The “DCF” sheet shows the Discounted Cash flow model it also has macros that lets the user choose different approaches.

Bike Shop DCF						Terminal Value Approach	
Tax Rate	25.65%					GGM	3,591,923
Long-Term Growth Rate	3.19%					Revenue Multiple	1,330,564
WACC	7.97%					EBITDA Multiple	1,659,763
						H-Model	6,242,274
	2024	2025	2026	2027	2028		
EBIT (Adjusted for Tax)	68,689	120,615	157,822	206,814	271,284	GGM	
Working Capital	20,486	26,924	35,386	46,508	61,125	Revenue	
Capex	-41,411	-54,304	-71,265	-93,571	-122,900	H-Model	
Depreciation/Amortization	12,757	17,573	23,796	31,884	42,433	EBITDA	
FCF	60,521	110,808	145,739	191,635	251,943		
Discounted FCF	56,053	95,052	115,788	141,012	171,704		
Sum of PV FCF					407,906		
Terminal Value Using GGM					3,591,923		
PV of Terminal Value					2,447,968		
Value					2,855,874		

The “Sensitivity Model” sheet shows the sensitivity of the DCF. It only works for the GGM approach, so there is a macro that hides this sheet when another approach is used.

Bike Shop DCF Sensitivity									
WACC	Long-term growth rate								
		2.19%	2.69%	3.19%	3.69%	4.19%		Sensitivity Model	
	6.97%	\$ 0.76	\$ 0.83	\$ 0.93	\$ 1.05	\$ 1.23		Chosen WACC	7.97%
	7.47%	\$ 0.67	\$ 0.72	\$ 0.80	\$ 0.89	\$ 1.01		Chosen Growth rate	3.19%
	7.97%	\$ (0.07)	\$ 0.64	\$ 0.69	\$ 0.76	\$ 0.85		Increments	0.50%
	8.47%	\$ 0.53	\$ 0.57	\$ 0.61	\$ 0.67	\$ 0.73			
	8.97%	\$ 0.48	\$ 0.51	\$ 0.55	\$ 0.59	\$ 0.64			

The “Asset Schedule” lets the user create a asset schedule for the company. This sheet will only be shown when the user decides to use an asset schedule. This is triggered by the asset schedule macro in the “Assumptions” sheet.

Bike Shop Asset Schedule									
Capital Expenditure		Life of Asset		2024	2025	2026	2027	2028	
2024	10,000	5		2,000	2,000	2,000	2,000	2,000	
2025	40,000	5			8,000	8,000	8,000	8,000	
2026	50,000	5				10,000	10,000	10,000	
2027	100,000	5					20,000	20,000	
2028	100,000	5						20,000	
Total Depreciation				2,000	10,000	20,000	40,000	60,000	
Opening Balance				68,646	76,646	106,646	136,646	196,646	
Capex				10,000	40,000	50,000	100,000	100,000	
Depreciation				2,000	10,000	20,000	40,000	60,000	
Closing Balance				76,646	106,646	136,646	196,646	236,646	

The “Summary” sheet shows the conclusion of the valuation and lets the user choose the weighting of the different valuation approaches.

Bike Shop Valuation Summary		
Valuation Method	Enterprise Value	Weighting
Guideline Publid Companies	\$2,507,344	33.33%
Comparable Transaction Analysis	\$2,398,473	33.33%
Discounted Cash Flow Analysis	\$2,855,874	33.33%
OPM Backsolve	\$17,627,881	0.00%
Enterprise Value	\$2,587,228	
Plus: Cash	\$30,794	
Less: Debt	\$63,416	
Equity Value	\$2,554,607	
Common Share Value	\$0.62	

There are some limitations to my Backsolve macro. It can only handle simple Cap Tables. It will not be able to handle:

- Participating Securities
- Cumulative dividends
- Warrants
- Option pools
- More than five seniority levels
- More than 36 breakpoints

Reflection and Insights

This assignment was instrumental in bridging the gap between my computer science and business skills by delving into VBA coding and creating a valuation model, which extended my knowledge from business classes. ChatGPT played a pivotal role by assisting in coding and problem-solving, especially considering my novice status in VBA. Initially, certain aspects of the project, like developing the Backsolve macro, seemed daunting. However, diving into the task

revealed that my preparatory work had equipped me better than I realized, teaching me the value of thorough preparation and overcoming the fear of tackling unfamiliar challenges.

Learning VBA has not only expanded my skill set but also promises immediate applications in my upcoming summer stint in real estate investments, where Excel proficiency is paramount.

Furthermore, it distinguishes me in the finance field, providing an edge over peers lacking similar technical expertise.

Personal Reflection

A notable strength I observed is my adaptability in learning new skills, largely through self-paced exploration and online resources like YouTube tutorials. However, a weakness surfaced in my time management, as I tended to procrastinate and accumulate tasks towards the end of the semester, causing undue stress. Nevertheless, this project has significantly bolstered my confidence in coding and willingness to undertake BCIS-related tasks, marking a notable personal growth.

Lessons Learned

The inability to utilize the initially planned FactSet plugin necessitated a creative approach to data acquisition, underscoring the importance of adaptability and resourcefulness in problem-solving. This project has not only equipped me with new technical skills but also imparted valuable lessons in self-directed learning and resilience in the face of unforeseen challenges.

Conclusions

While I'm pleased with the outcome of this project—a functional, automated valuation model—I acknowledge certain unmet goals, such as implementing a PDF-generating macro and automating data input through the FactSet plugin. Future iterations will prioritize these enhancements, alongside refining visual aesthetics and ensuring accurate calculation methodologies. Reflecting on this experience, I recognize the importance of prioritizing and allocating resources efficiently, which could have expedited the project's development given additional time and resources.

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