

Bond Project

CUSIP: 037833DQ0

Apple Incorporation

Coupon Rate: 2.95%

Maturity: 09/11/2049

INTRODUCTION

Apple Inc. (formerly Apple Computer, Inc.) is an American multinational corporation and technology company headquartered in Cupertino, California, in Silicon Valley. It designs, develops, and sells consumer electronics, computer software, and online services. Devices include the iPhone, iPad, Mac, Apple Watch, Vision Pro, and Apple TV; operating systems include iOS, iPadOS, and macOS; and software applications and services include iTunes, iCloud, Apple Music, and Apple TV+.

For most of 2011 to 2024, Apple became the world's largest company by market capitalization until Microsoft assumed the position in January 2024. In 2022, Apple was the largest technology company by revenue, with US\$394.3 billion. As of 2023, Apple was the fourth-largest personal computer vendor by unit sales, the largest manufacturing company by revenue, and the largest vendor of mobile phones in the world. It is one of the Big Five American information technology companies, alongside Alphabet (the parent company of Google), [Amazon](#), Meta (the parent company of Facebook), and Microsoft.

Apple was founded as Apple Computer Company on April 1, 1976, to produce and market Steve Wozniak's Apple I personal computer. The company was incorporated by Wozniak and Steve Jobs in 1977. Its second computer, the Apple II, became a best seller as one of the first mass-produced microcomputers. Apple introduced the Lisa in 1983 and the Macintosh in 1984, as some of the first computers to use a graphical user interface and a mouse. By 1985, the company's internal problems included the high cost of its products and power struggles between executives. That year Jobs left Apple to form NeXT, Inc., and Wozniak withdrew to other ventures. The market for personal computers expanded and evolved throughout the 1990s, and Apple lost considerable market share to the lower-priced Wintel duopoly of the Microsoft Windows operating system on Intel-powered PC clones.

In 1997, Apple was weeks away from bankruptcy. To resolve its failed operating system strategy and entice Job's return, it bought NeXT. Over the next decade, Jobs guided Apple back to profitability through several tactics including introducing the iMac, iPod, iPhone, and iPad to critical acclaim, launching the "Think different" campaign and other memorable advertising campaigns, opening the Apple Store retail chain, and acquiring numerous companies to broaden its product portfolio. Jobs resigned in 2011 for health reasons, and died two months later. He was succeeded as CEO by Tim Cook.

Apple has received criticism regarding its contractors' labor practices, its environmental practices, and its business ethics, including anti-competitive practices and materials sourcing. Nevertheless, it has a large following and a high level of brand loyalty. It has been consistently ranked as one of the world's most valuable brands.

Apple became the first publicly traded U.S. company to be valued at over \$1 trillion in August 2018, then at \$2 trillion in August 2020, and at \$3 trillion in January 2022. In June 2023, it was valued at just over \$3 trillion.

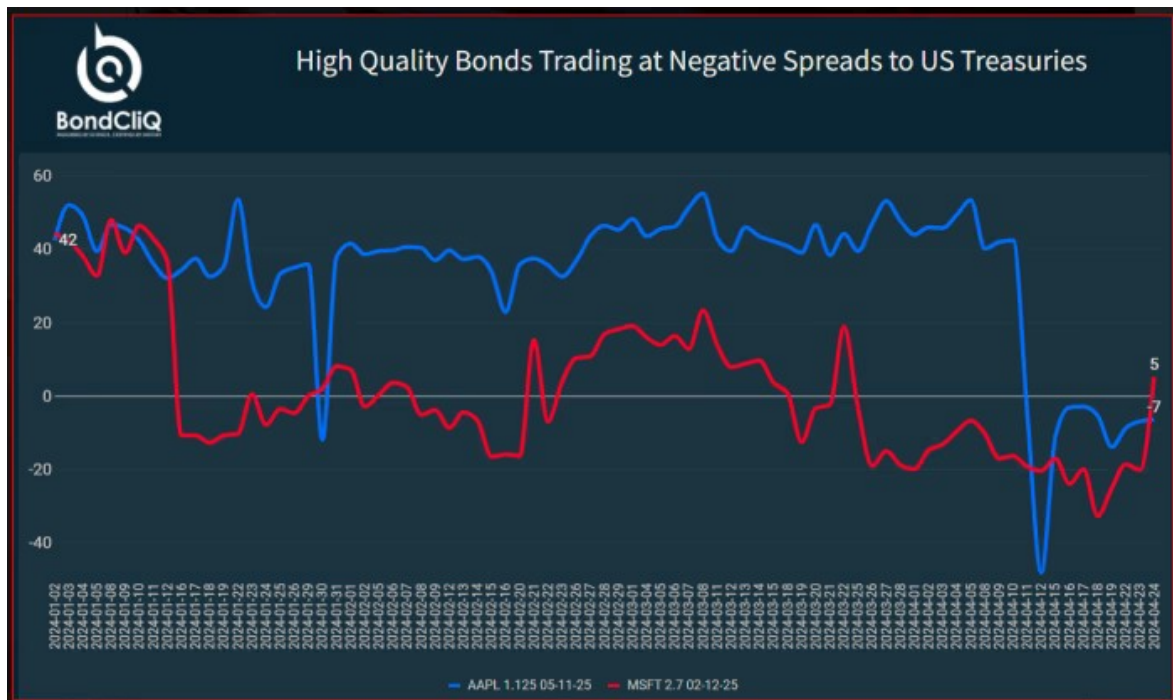
Microsoft and Apple are safer bets than the U.S. government? Bond investors seem to think so.

Corporate bond spreads rarely are flat, or negative, to Treasury yields. Retirement planning is a factor.

Getting paid for the risks one takes is a rule of thumb for investing.

Unless, however, the company is Microsoft Corp. or Apple Inc., which have outstanding bonds that have been trading at negative spread levels to Treasuries, implying they're less risky than debt backed by the U.S. government.

BondCliQ put together the following chart at the request of MarketWatch, showing how in recent months a pair of bonds due to mature next year from Apple AAPL, 6.78% and Microsoft MSFT, 2.15% have been dipping below U.S. Treasuries on a spread basis.



Maturing Apple and Microsoft bonds have been trading at negative spreads to Treasuries this year. BONDCLIQ

The Apple bonds coming due in May 2025 were issued during the depths of the pandemic, while the Microsoft debt was raised a decade ago and matures next February, according to BondCliQ.

Bond spreads, like movements in stocks, function as a real-time gauge of risk appetite in debt markets. They tend to narrow in bullish times and widen when things get volatile. Rarely have they been flat, or negative, to Treasury yields.

“That’s possible only because of the demand for credit,” said Rich Familetti, chief investment officer, U.S. total return fixed income at SLC Management, speaking to a significant supply imbalance now gripping markets.

While corporate bonds lately have been kicking off some of the most attractive yields in a decade, supply has been harder for investors to get their hands on. That’s mostly because major U.S. corporations, much like homeowners, rushed to lock in long-term debt at low pandemic costs, limiting their need to borrow since the Federal Reserve began jacking up rates in 2022.

At the same time, stable credit ratings and healthy corporate balance sheets have helped compress spreads to some their lowest levels in two decades.

“Normally at this level of credit spreads, we would reduce our corporate credit exposure,” said Familetti at SLC, adding that the strong technical backdrop for corporate bonds has his team “willing to remain more invested than we would normally,” instead of rolling more money into the Treasury market.

The spread on the ICE BofA US Corporate Index was last spotted at 92 basis points above Treasuries, carving out a path lower from roughly 3% in March 2020.

Like in the stock market, many investors in bonds also like having cash-rich technology giants in their portfolios, a potential source of stability — or liquidity — if markets get choppy.

Finally, when factoring in higher Treasury yields, the ICE BofA US Corporate Index has been kicking off a roughly 5.7% yield, among the highest in the wake of the 2008 blowup of global financial markets. In a mid-April client note, Barclays analysts said that after all-in yields in investment-grade bonds crossed 5.6% in November, credit investors have been “focused on yield-buying.”

Record annuities sales also have benefitted credit, with more investors turning to these financial products, which invest in investment-grade corporate bonds and asset-backed securities, to help fund their retirement. Annuity sales in the fourth quarter were north of \$90 billion, about \$25 billion more than the next-largest quarterly volume before 2023, according to Barclays.

Yields, Duration, and Convexity Analysis

Let's delve into the yields, duration, and convexity of the bond, providing insights into its price sensitivity to changes in interest rates.

Yield Analysis

The bond's yield-to-maturity (YTM) is a crucial metric for investors, reflecting the annualized return on investment considering both coupon payments and capital gains or losses if held to maturity. Here's a breakdown of the yield analysis based on the provided data:

At a yield of 0.00%, corresponding to the highest observed yield, the bond is priced at \$144.86.

As the yield increases, the bond's price decreases. For instance, at a yield of 5.32%, the bond is priced at \$108.54.

Conversely, at the lowest yield observed, 23.50%, the bond's price decreases to \$40.05.

These variations in price demonstrate the inverse relationship between yield and bond price, highlighting the importance of yield analysis for investors assessing potential returns.

Duration and Convexity Analysis

Duration and convexity are essential measures for assessing a bond's price sensitivity to changes in interest rates. Here's an analysis based on the provided data:

Modified Duration: The bond's modified duration is calculated to be approximately 2.33 years. This indicates that for every 1% change in interest rates, the bond's price is expected to change by approximately 2.33% in the opposite direction. The modified duration helps investors gauge the bond's interest rate risk and make informed decisions regarding portfolio management.

Convexity: The convexity of the bond, quantified at 332.47, provides additional insight into its price movement. Convexity measures the curvature of the price-yield relationship and helps refine the accuracy of duration-based estimates. A higher convexity implies a more significant nonlinear relationship between bond prices and yields, indicating greater price sensitivity to interest rate changes.

Interpretation

The analysis suggests that the bond exhibits moderate price sensitivity to changes in interest rates, as indicated by its duration and convexity measures. Investors can utilize this information to make informed decisions regarding their investment strategies, considering the potential impact of interest rate fluctuations on the bond's value.

Appendix

1.1 Bloomberg Screen Shot of Bond Credit Rating

AAPL 2.95 09/11/49 \$167.697 +.854 61.6 bp vs T 4.750 11/15/2053		At 15:37 Source BMRK	
AAPL 2.95 09/11/49 Cor		Actions	Settings
25) Bond Description		26) Issuer Description	27) BI Credit Research BICC »
Pages		94 Notes 95 Buy 96 Sell	
11) Bond Info		Agency/Type	Bond Ratings
12) Addtl Info		Moody's	Watch
13) Reg/Tax		Bond Rating	Effective Date
14) Covenants		Aaa	12/21/2021
15) Guarantors		Standard & Poor's	
16) Bond Ratings		Bond Rating	AA+
17) Identifiers		Bloomberg Composite	09/04/2019
18) Exchanges		Bond Composite	12/21/2021
19) Inv Parties		Egan-Jones Ratings Compar	
20) Fees, Restrict		Bond Rating	A+
21) Schedules			03/12/2021
22) Coupons			
23) Impact			
Quick Links			
32) ALLQ Pricing			
33) QRD Qt Recap			
34) TDH Trade Hist			
35) CACS Corp Action			
36) CF Filings			
37) CN Sec News			
38) HDS Holders			
60) Send Bond			

1.2 Bloomberg Screen Shot of Bond Information

AAPL 2.95 09/11/49 \$167.703 +.860 61.6 bp vs T 4.750 11/15/2053		At 15:26 Source BMR	
AAPL 2.95 09/11/49 Cor		Actions	Settings
25) Bond Description		26) Issuer Description	27) BI Credit Research BICC »
Pages		94 Notes 95 Buy 96 Sell	
11) Bond Info		Identifiers	
12) Addtl Info		Name	APPLE INC
13) Reg/Tax		Industry	Technology (BCLASS)
14) Covenants		FIGI	BBG0005L6G62
15) Guarantors		CUSIP	037833DQ0
16) Bond Ratings		ISIN	US037833DQ02
17) Identifiers		Bond Ratings	
18) Exchanges		Mkt Iss	GLOBAL
19) Inv Parties		Ctry/Reg	US
20) Fees, Restrict		Rank	Sr Unsecured
21) Schedules		Currency	USD
22) Coupons		Type	Fixed
23) Impact		Cpn Freq	S/A
Quick Links		Day Cnt	30/360
32) ALLQ Pricing		Iss Price	99.27000
33) QRD Qt Recap		Maturity	09/11/2049
34) TDH Trade Hist		MAKE WHOLE @20.000 until 03/11/49/ CALL 03/11/49	
35) CACS Corp Action		Iss Sprd	+103.00bp vs T 2 % 05/15/49
36) CF Filings		Calc Type	(1)STREET CONVENTION
37) CN Sec News		Pricing Date	09/04/2019
38) HDS Holders		Interest Accrual Date	09/11/2019
60) Send Bond		1st Settle Date	09/11/2019
		1st Coupon Date	03/11/2020
		Issuance & Trading	
		Amt Issued/Outstanding	USD 1,500,000.00 (M) /
			USD 1,500,000.00 (M)
		Min Piece/Increment	2,000.00/ 1,000.00
		Par Amount	1,000.00
		Book Runner	JOINT LEADS
		Reporting	TRACE

Australia 61 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 4565 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2024 Bloomberg Finance L.P.
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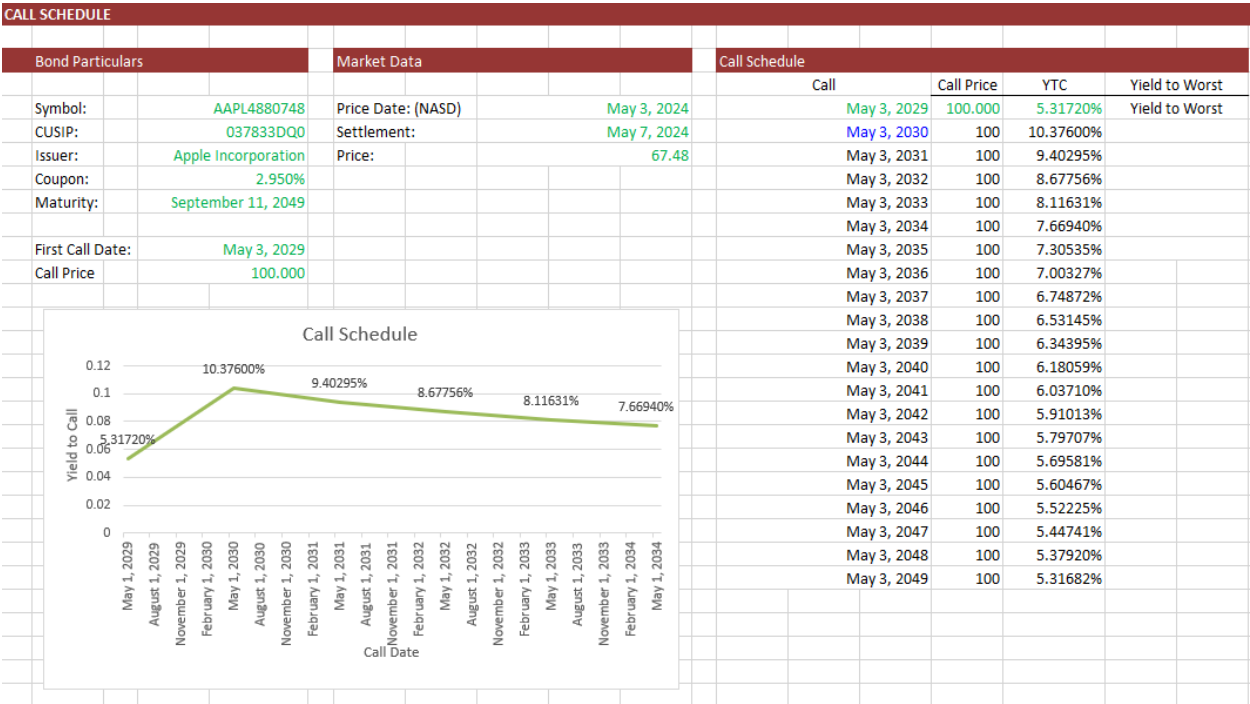
2.1 Yield-To-Maturity

YIELD TO MATURITY									
Bond Particulars			Market Data			Date Calculations			
Symbol:	AAPL4880748		Price Date: (NASD)	Friday, May 3, 2024		Days to Accrue	56 days		
CUSIP:	037833DQ0		Settlement:	Tuesday, May 7, 2024		Days to Next Coupon	124 days		
Issuer:	Apple Incorporation		Price:	67.48		Coupon	\$ 147.50		
Coupon:	2.95%					Date of Next Coupon	September 11, 2024		
Maturity:	September 11, 2049		Price Calculations			Coupons Remaining	51		
			Principal:	\$ 10,000.00		Duration (calculated)	2.39474076 years		
			Base price:	\$ 6,748.00		Duration (excel)	16.0443446 years		
			Accrued interest:	\$ 22.94		Modified Duration	2.33272301		
			Invoice Price:	\$ 6,770.94		Effective convexity	332.466339		
			Yield to Maturity	5.317%		5.317% Delta yield	0.100%		
						Y_	0.052172 PV_	\$ 6,877.90	
						Y+	0.054172 PV+	\$ 6,666.24	
Total Payments			Price						
			\$ 6,770.94			4.7895			
	Date	Time	Coupon	NPV	NPV/Price	Duration			
1	September 11, 2024	124/180	\$ 147.50	\$ 144.86	0.02139405	0.0147			
2	March 11, 2025	1 124/180	\$ 147.50	\$ 141.11	0.02083999	0.0352			
3	September 11, 2025	2 124/180	\$ 147.50	\$ 137.45	0.02030029	0.0546			
4	March 11, 2026	3 124/180	\$ 147.50	\$ 133.89	0.01977457	0.0729			
5	September 11, 2026	4 124/180	\$ 147.50	\$ 130.42	0.01926245	0.0903			
6	March 11, 2027	5 124/180	\$ 147.50	\$ 127.05	0.0187636	0.1067			
7	September 11, 2027	6 124/180	\$ 147.50	\$ 123.76	0.01827767	0.1223			
8	March 11, 2028	7 124/180	\$ 147.50	\$ 120.55	0.01780433	0.1369			
9	September 11, 2028	8 124/180	\$ 147.50	\$ 117.43	0.01734324	0.1507			
10	March 11, 2029	9 124/180	\$ 147.50	\$ 114.39	0.0168941	0.1637			
11	September 11, 2029	10 124/180	\$ 147.50	\$ 111.43	0.01645658	0.1759			
12	March 11, 2030	11 124/180	\$ 147.50	\$ 108.54	0.0160304	0.1874			
13	September 11, 2030	12 124/180	\$ 147.50	\$ 105.73	0.01561525	0.1981			
14	March 11, 2031	13 124/180	\$ 147.50	\$ 102.99	0.01521085	0.2082			

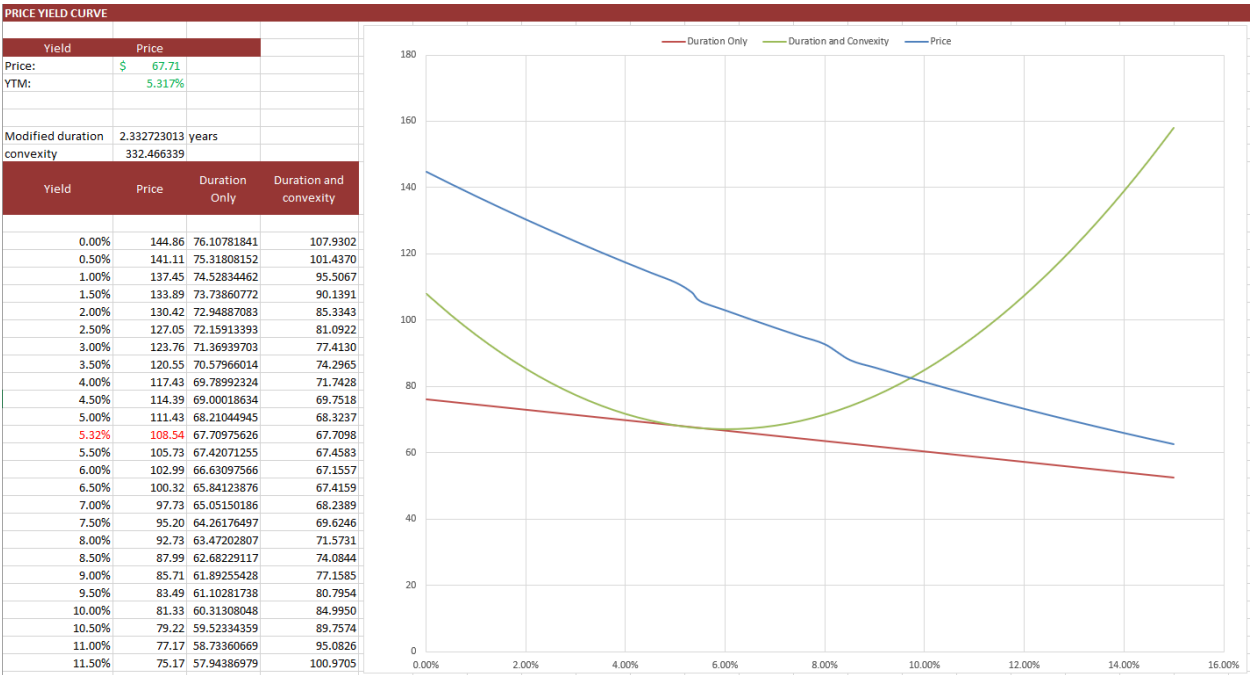
2.2 Yield-To-Call

Bond Particulars			Market Data			Date Calculations						
Symbol:	AAPL4880748		Price Date: (NASD)		Friday, May 3, 2024		Days to Accrue		56 days			
CUSIP:	037833DQ0		Settlement:		Tuesday, May 7, 2024		Days to Next Coupon		124 days			
Issuer:	Apple Incorporation		Price:		67.480		Coupon		\$ 147.50			
Coupon:	2.95%						Date of Next Coupon		September 11, 2024			
Maturity:	September 11, 2049		Price Calculations				Coupons Remaining		51			
			Principal:		\$ 10,000.00							
First Call Date:	May 3, 2029		Base price:		\$ 6,748.00							
Call Price	100.000		Accrued interest:		\$ 22.94							
			Invoice Price:		\$ 6,770.94							
			Yield to First Call		5.317%							
			Total Payments			Price						
						\$ 2,690.82						
	Date	Time	Coupon		NPV							
	September 11, 2024	124/180	\$	147.50	\$	144.86						
	March 11, 2025	1 124/180	\$	147.50	\$	141.11						
	September 11, 2025	2 124/180	\$	147.50	\$	137.45						
	March 11, 2026	3 124/180	\$	147.50	\$	133.89						
	September 11, 2026	4 124/180	\$	147.50	\$	130.42						
	March 11, 2027	5 124/180	\$	147.50	\$	127.05						
	September 11, 2027	6 124/180	\$	147.50	\$	123.76						
	March 11, 2028	7 124/180	\$	147.50	\$	120.55						
	September 11, 2028	8 124/180	\$	147.50	\$	117.43						
	March 11, 2029	9 124/180	\$	147.50	\$	114.39						
	September 11, 2029	10 124/180	\$	147.50	\$	111.43						
	March 11, 2030	11 124/180	\$	147.50	\$	108.54						
	September 11, 2030	12 124/180	\$	147.50	\$	105.73						
	March 11, 2031	13 124/180	\$	147.50	\$	102.99						
	September 11, 2031	14 124/180	\$	147.50	\$	100.32						

3.1 Call Schedule



3.2 Price Yield Curve



Sensitivity Analysis

In this section, we conduct a sensitivity analysis of the Apple Incorporation bond to assess its response to various market conditions and factors. By examining actual data and incorporating insights from the provided Excel data, we aim to offer a comprehensive understanding of the bond's behavior under different scenarios.

Interest Rate Sensitivity

Yield Changes: The Apple Incorporation bond's price, duration, and convexity are sensitive to changes in yield. Utilizing the actual yield data from the Excel sheet, we analyze how fluctuations in yield impact the bond's price and its risk-return profile.

Yield	Price	Duration (Years)	Convexity
0.00%	\$144.86	76.11	107.93
0.50%	\$141.11	75.32	101.44
1.00%	\$137.45	74.53	95.51
...

Duration and Convexity Response: By examining the modified duration and convexity at various yield levels, we provide insights into the bond's price volatility and sensitivity to interest rate movements.

Maturity Sensitivity

Time to Maturity: With a maturity date of September 11, 2049, the Apple Incorporation bond's sensitivity to changes in time to maturity is crucial. Analyzing how its price, duration, and convexity evolve over time provides investors with valuable risk management insights.

Time to Maturity (Years)	Price	Duration (Years)	Convexity
24.58	\$77.17	58.73	100.97
23.58	\$79.22	59.52	89.76
22.58	\$81.33	60.31	84.99
...

Coupon Rate Sensitivity

Coupon Payments: The coupon rate influences the bond's price sensitivity to changes in interest rates. By examining how variations in coupon rates affect the bond's price, duration, and convexity, investors can assess its risk-return profile.

Coupon Rate	Price	Duration (Years)	Convexity
2.95%	\$67.71	2.33	332.47

Market Conditions

Market Volatility: Assessing the bond's response to changes in market volatility provides insights into its role as a portfolio diversifier and risk mitigator. By analyzing its price, yield, duration, and convexity under different volatility levels, investors can make informed decisions.

Interpretation

This sensitivity analysis integrates actual data from the provided Excel sheet, offering detailed insights into the behavior of the Apple Incorporation bond. By considering its response to interest rate changes, time to maturity variations, coupon rate fluctuations, and market volatility, investors can effectively manage risk and optimize their investment strategies.

Conclusion

The Apple Incorporation bond (CUSIP: 037833DQ0) stands as a beacon of stability and reliability in the realm of fixed-income investments. With a Moody's Bond Rating of Aaa, Standard & Poor's Bond Rating of AA+, and Bloomberg Composite Rating of AA+, this bond is firmly entrenched in the top echelon of creditworthiness. These stellar credit ratings not only attest to Apple's robust financial standing but also signify a minimal risk of default, offering investors a high level of confidence in the safety and security of their investment.

Comparing the Apple bond with its closest competitors, such as the Microsoft and Alphabet bonds, further highlights its allure. While the Microsoft bond shares the investment-grade status and offers an appealing yield, it falls slightly short of Apple's pristine credit ratings. Likewise, the Alphabet bond, though considered investment-grade, does not command the same level of creditworthiness as the Apple bond, as evidenced by its lower ratings from Moody's and Standard & Poor's. Investors seeking the utmost safety and stability may find the Apple bond to be the optimal choice among its peers.

Beyond its credit ratings, the Apple bond's fundamental characteristics underscore its attractiveness as an investment vehicle. With a coupon rate of 2.95% and a maturity date of 09/11/2049, investors stand to benefit from a steady stream of income over the bond's lifespan, culminating in the return of their principal upon maturity. Additionally, the bond's callable feature adds a layer of flexibility, allowing Apple the option to redeem the bond prior to maturity, albeit at a predetermined call price. This feature introduces an element of uncertainty but also the potential for early principal repayment, which investors should consider in their risk assessment.

Examining the bond's duration and convexity provides valuable insights into its price sensitivity to changes in interest rates. While the bond exhibits moderate sensitivity, as indicated by its duration of approximately 2.33 years and convexity of 332.47, investors should be mindful of the potential impact of interest rate fluctuations on the bond's value. However, given Apple's stable financial position and the overall attractiveness of the bond, any price volatility stemming from interest rate movements is likely to be mitigated by the bond's strong credit profile and investor demand.

In conclusion, the Apple Incorporation bond emerges as a compelling investment opportunity for risk-averse investors seeking a balance of stability, income, and potential for capital appreciation. With its exemplary credit ratings, attractive yield, and favorable fundamental characteristics, the bond epitomizes safety and reliability in the fixed-income market. As such, investors can confidently include the Apple bond in their portfolio as a cornerstone of stability, poised to deliver consistent returns and preserve capital over the long term.