

Proper Generative AI Prompting for Financial Analysis

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Abstract

Generative artificial intelligence (AI) is revolutionizing financial analysis by efficiently processing vast amounts of data to extract valuable information. Properly leveraging prompts is crucial for accurate and insightful results. This article presents a comprehensive guide to prompt usage in generative AI for financial analysis. It emphasizes the significance of prompts, provides insights on writing effective prompts, and highlights common pitfalls to avoid. Mastering generative AI prompting enhances financial analysis and informs investment decisions, making professionals more sought after. The article explores AI chatbots like ChatGPT, Google Bard, and Bing AI, empowering analysts to optimize prompt generation and improve AI-generated responses. Crafting clear, tailored prompts is vital for accurate and actionable insights. Best practices include treating chatbots as intelligent entities, incorporating context awareness, personalizing prompts, defining roles and styles, and using appropriate formats and phrasing. Poor and effective prompt examples demonstrate the importance of specificity and prompt templates offer a structured approach tailored to financial investment analysis. Enhancing prompt quality through context and control techniques leads to precise AI-generated responses. Mastering generative AI prompting is a necessary skill that unlocks AI's true potential in financial analysis, facilitating accurate and insightful decision-making.

Keywords: artificial intelligence, investment analysis, prompting, generative AI models, financial analysis, impact of technology on financial markets

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Introduction

Within the dynamic landscape of financial analysis, where accurate and timely decision-making is paramount, the integration of generative artificial intelligence (AI) has emerged as a transformative tool.¹ Generative AI can be used to process, summarize, and extract valuable information from large volumes of financial data and textual information, facilitating more efficient analysis and decision-making.

One of the most important aspects of using generative AI for financial analysis is the use of prompts, which are the instructions given to an AI model to help it generate the desired output. For example, a prompt might be “generate a list of all companies in the energy sector that have reported double-digit earnings growth in the past quarter” or “which firms in the consumer discretionary sector have recently added references to artificial intelligence in the management’s discussion section of the most recent 10-K and 10-Q reports.”

The right prompts can help generative AI models produce more accurate and insightful results; however, it is important to use prompts correctly. If the prompts are too vague or ambiguous, the AI model may not be able to generate the desired output. Conversely, if the prompts are too specific, the model may not be able to generate any meaningful or useful output.

This article provides a guide to properly using prompts in generative AI for financial analysis. It discusses the importance of prompts, how to write effective prompts,

¹ Generative AI refers to a subset of artificial intelligence techniques that involve training models to generate new content, such as text, images, or videos, based on patterns and examples from existing data.

and highlights some of the common pitfalls to avoid. Finance majors will be in higher demand if they can master the use of generative AI to improve their financial analysis and make more informed investment decisions. Mastering generative AI prompting will become a necessary skill needed to unlock AI's potential in financial analysis, enabling accurate and insightful decision-making.²

Overview

OpenAI's ChatGPT made a decisive impact in the world of technology with its launch in November 2022, quickly garnering more than 100 million users within two months, setting a record as the fastest technology application to achieve this milestone.³ Following this remarkable feat, other noteworthy announcements soon followed. In February 2023, Microsoft introduced Bing AI, which featured a chatbot powered by ChatGPT. The next month, OpenAI unveiled an upgraded version of ChatGPT, capitalizing on GPT-4, a leading large language model.⁴ This iteration of ChatGPT generates text that is virtually indistinguishable from human-written content. Also, in March 2023, Google introduced Bard, a generative AI chatbot resembling ChatGPT, designed to offer diverse purposes such as customer service, marketing, and education.

These developments serve as a testament to the growing interest in generative AI chatbots and indicate a promising trajectory of their adoption across various sectors in the

² Krause (2023) emphasizes the need for an updated finance curriculum to prepare future analysts for an AI-driven environment, emphasizing AI understanding, data analysis, collaboration, and ethical considerations.

³ This achievement shattered the previous record held by TikTok, which took nine months to reach the 100 million user count.

⁴ A large language model is an advanced natural language processing system that leverages deep learning techniques to generate contextually relevant text based on the provided input.

years ahead. McKinsey & Company (2023) stated that while generative AI is still in its early stages of development, it has the potential to revolutionize many industries. It has the potential to be one of the most significant breakthroughs in terms of automation replacing humans – especially in the financial and accounting sectors. However, *The Economist* (2023) notes that while AI can replace some jobs, it will also create new jobs and opportunities in the long run. Dilmega (2023) further notes that human intervention will be needed in the future to support automation in areas such as financial analysis, payroll administration, invoice automation, collections action, auditing, and the preparation of financial statements.

Financial analysts are responsible for navigating through an ocean of data to uncover valuable insights which makes data analytic and AI tools invaluable. Generative AI models are easy to use and can be an incredibly powerful tool to analysis and automate tasks, but it is important to know how to use the technology correctly. Knowledge about how to leverage prompting effectively can not only save time but can result in more timely and informed financial decisions.

Prompting is a crucial skill in the world of generative AI models, particularly for tasks like financial analysis and report writing. By providing specific cues or instructions to AI models, known as prompts, users can increase the likelihood they will generate the desired outputs. The quality of a prompt significantly influences the accuracy and relevance of the AI-generated responses. This article serves as a comprehensive guide to effectively using prompts in generative AI, with a focus on financial analysis. By understanding the fundamentals of prompts and implementing effective prompt engineering strategies, financial professionals can enhance their AI-powered analyses and decision-making processes.

Understanding the Basics of Prompts

In the realm of generative AI for financial analysis, the concept of prompting plays a pivotal role. A prompt acts as an input, usually in the form of a text command or question, given to an AI model to elicit a desired output. By providing a specific direction or goal, prompts guide the AI model's generation process, influencing the accuracy and relevance of the responses produced. In essence, the quality of prompts directly impacts the effectiveness of AI-generated insights. Clear, specific, and tailored prompts serve as the foundation for obtaining accurate and actionable outputs, enabling financial analysts to make informed decisions based on the AI-generated analyses.

With a well-crafted prompt, analysts can shape the AI model's focus, effectively narrowing down its scope to the specific financial aspects or areas of interest they seek to explore. This level of customization empowers analysts to extract targeted insights and extract key information that directly aligns with their investment strategies. By leveraging clear and tailored prompts, analysts enhance the precision and relevance of the AI-generated responses, enabling them to uncover hidden patterns, detect emerging trends, and make data-driven decisions with greater confidence. Thus, understanding and utilizing prompts effectively becomes imperative for financial analysts aiming to harness the true potential of generative AI in their quest for accurate and insightful financial analysis.⁵

Different AI Chatbots

When it comes to crafting effective prompts for generative AI in financial analysis, it is useful to have a deep understanding of the strengths and weaknesses of the popular AI

⁵ Krause (2023) explores the use of generative AI tools in finance and suggests thorough employee training, including prompting, to ensure responsible use and meaningful outputs.

chatbot systems. In this article the focus is on the three most popular systems, including ChatGPT, Google Bard, and Bing AI. While appearing to be quite similar, as shown in Table 1, each possesses different and unique capabilities that can be leveraged to optimize prompt generation and enhance the quality of AI-generated responses.

Table 1
Characteristics of AI Models

Model	Cost	Data source	Update status	Access to internet
ChatGPT	\$20/month ⁶	OpenAI's GPT-4	Less up-to-date	No
Bard AI	Free	Infiniset ⁷	Generally up-to-date	Yes
Bing AI	Free	Microsoft's LLM	Current	Yes

The most notable system is ChatGPT, which is renowned for its ability to generate natural-sounding responses. The human-like responses have made this well-suited for tasks that involve customer support or chat-based interactions. It is likely that most people who have encountered chatbots on websites are familiar with how to interact with ChatGPT. Its proficiency in simulating natural conversations between two people can be advantageous in financial analysis scenarios where effective communication and engagement with clients or users are important. By tailoring prompts that align with conversational formats, analysts can tap into the strengths of ChatGPT and elicit responses that feel authentic and relevant. This system does not have any access or connection with the internet, nor does it have any connection with an external data source.

Another notable system is Google Bard, also known as Bard AI. This system excels in producing creative and engaging content that makes it a valuable tool for tasks

⁶ OpenAI has released ChatGPT-4, which is available to Plus plan users for \$20 per month, while ChatGPT-3.5 is free to use.

⁷ Infiniset is a massive dataset of text and code that was used to train Google's large language model.

such as content creation or evaluating social media content. By crafting prompts that emphasize the need for imaginative solutions or captivating narratives, users can leverage Google Bard's strengths to generate compelling outputs that resonate with their target audience. Both Bard AI and ChatGPT are being updated regularly with new information and data; however, Bard AI's content is newer and has access to a wider range of information, including the internet in real time. This means that Bard AI is generally more current than ChatGPT, which is important to financial analysts who tend to rely on up-to-date information.

The third model is Bing AI, which is designed to provide concise and specific responses, making it particularly suitable for question-answering and fact-checking tasks. Financial analysts can leverage this system's ability to deliver accurate and focused information by constructing prompts that explicitly seek concise answers to specific financial queries. This enables analysts to quickly obtain relevant information and validate their hypotheses or assumptions in a streamlined manner. Bing AI is current and has access to a wide range of sources, including the internet in real time. In addition, it is trained on a massive dataset of text and code, which allows it to understand and respond to a wide range of queries making it well-suited for research, learning, and creativity.

Table 2 displays the key features of each AI model. By understanding the attributes of AI chatbot systems such as ChatGPT, Google Bard, and Bing AI, financial analysts can strategically tailor prompts to leverage the unique capabilities of each system. This knowledge empowers analysts to optimize their interactions with generative AI, thereby enhancing the accuracy, relevance, and efficiency of AI-generated responses in financial analysis tasks.

Table 2
Features of AI Models

Model	Features
ChatGPT	Can chat with humans in a natural and engaging way. Can also generate creative text formats of text content, like tables, lists, code, scripts, email, essays, letters, etc. Can answer questions in a comprehensive and informative way, even if they are open ended, challenging, or strange.
Bard AI	Can understand and respond to a wide range of queries, including natural language queries. Can also generate creative text formats of text content, like tables, lists, code, scripts, email, essays, letters, etc.
Bing AI	Can understand and respond to a wide range of queries, including natural language queries. Also has a variety of features that can help the user find the information they need, such as a powerful search engine, a variety of filters and options to help narrow down the search results, and a variety of tools to help the user understand and use the information they find.

Crafting Effective Prompts

When it comes to prompt writing for chatbots, adhering to best practices can significantly enhance the experience and the effectiveness of the interactions. To optimize the performance of a chatbot, several key considerations should be considered.

- It is crucial to treat the chatbot as an intelligent entity. By doing so, the prompts can be designed to reflect a natural conversation flow, allowing users to engage with the chatbot more intuitively. Clear and concise language should be used, avoiding ambiguity, and ensuring that the chatbot understands user input accurately.
- Prompts should be crafted with specific contexts in mind. This means considering the current situation or query and tailoring the response accordingly. By incorporating context-awareness into prompt writing, the chatbot can provide more relevant and helpful information to users, which is important to financial analysts.
- Personalization is another important aspect to consider. Making prompts personal and tailored to individual users creates a sense of connection and improves

engagement. By using variables or incorporating user-specific information within prompts, the chatbot can deliver a more personalized experience, enhancing user satisfaction.

- Defining the role, expertise, style, and tone of the chatbot is equally essential. This involves determining the chatbot's purpose, its areas of expertise, and the desired conversational style and tone. By establishing these parameters, the prompts can be crafted to align with the chatbot's intended persona and capabilities, ensuring consistency in interactions.
- Selecting appropriate formats and phrasing is crucial in prompt writing. These should be designed in a way that is easily understood by users and encourages clear responses. Using concise and straightforward language, while avoiding jargon or overly technical terms, enables effective communication and minimizes confusion. This is important for financial analysts where highly technical and industry-specific terms tend to be used.

Adhering to best practices for prompt writing can significantly enhance the performance of chatbots. By treating the chatbot as an intelligent entity, being clear and context-aware, personalizing prompts, defining the chatbot's role and style, and using appropriate formats and phrasing, users can steer the system into a more engaging and effective conversational experience.

Prompting Examples

The following example is a poorly written and ineffective prompt: “Give me information on Apple.” This prompt lacks specificity and does not provide clear guidance on what

exactly is required in terms of financial analysis.⁸ It is too broad and open-ended, making it difficult to provide a focused and comprehensive response. There are other instances of prompt phrasing that can be confusing or ambiguous. For example, using the word “not” (a negation) often can confuse an AI system about what is being asked and will typically result in poor outcomes.

A stronger and more effective prompt is: “Compare the historical performance and financial ratios of Apple Inc. and Microsoft Corporation over the past five years, highlighting key differences in profitability, liquidity, and investment potential.” This prompt is specific and clearly outlines the task at hand, which is to conduct a comparative analysis of two specific companies. It specifies the period (past five years) and highlights the specific financial metrics (profitability, liquidity, and investment potential) to be analyzed. This prompts the AI model to provide a detailed and structured financial analysis, allowing for a more meaningful and comprehensive response.

The appendix provides a comprehensive overview of the responses generated by the three AI models in relation to the question. Each model possesses its own set of strengths and weaknesses in terms of their respective responses. Notably, ChatGPT excels in time series ratio analysis, offering valuable insights in this aspect. However, it should be noted that the data utilized by ChatGPT is relatively outdated, which can be a problem for financial analysts. On the other hand, Bard AI presents current information and demonstrates strong analytical capabilities, although it falls short in terms of providing a complete analysis spanning the full five-year period. Lastly, Bing AI showcases robust financial comparative analysis and engages in dialogue effectively. However, it is worth mentioning that obtaining the desired information from Bing AI often requires the input

⁸ This query could just as likely generate an output related to the fruit.

of multiple prompts. By evaluating these distinct qualities, financial professionals can make informed decisions on which AI model best aligns with their specific needs and objectives.⁹

Another example of a poorly written prompt would be: “What are the risks of investing in cryptocurrency?” This prompt is too broad and lacks focus. It does not specify which cryptocurrency or provide any context regarding the period or the specific risks to be discussed. It can lead to a vague and generalized response, lacking depth and relevance. Another tip to avoid steering the response would be to write a prompt that seeks both sides of a question, in this case asking not only about the risk but also the benefits.

The following is a much stronger and effective prompt: “Analyze the risks and benefits associated with investing in Bitcoin as compared to traditional investment assets such as stocks and bonds, considering factors such as price volatility, regulatory environment, and cybersecurity threats. Provide recommendations on risk mitigation strategies for potential Bitcoin investors.” This detailed prompt provides clearer guidance on the scope of the analysis, focusing on the risks and benefits associated with investing in Bitcoin specifically. It specifies the comparative aspect with traditional investment assets (stocks and bonds) and highlights key risk factors to be evaluated (price volatility, regulatory environment, and cybersecurity threats). Additionally, it adds an actionable component by asking for recommendations on risk mitigation strategies, making the prompt more comprehensive and engaging.

⁹ Some financial analysts find that prompting for responses to be output in a tabular format beneficial and useful for exporting into spreadsheets.

Prompt Templates

Using prompt templates is a good idea because it can help the user create prompts that are clear, concise, and easy to understand. They can also help ensure that prompts are consistent with the overall goals and objectives of the analysis. Here is an example of a template for structuring prompts a condensed template for a financial analysis specifically tailored to a company like Apple Inc.

- **Role:** Conduct a comprehensive financial analysis of Apple Inc. as an investment opportunity
- **Objective:** Evaluate the financial performance and investment potential of Apple
- **Details:** Consider key financial metrics, market trends, and competitive landscape
- **Background:** Evaluate the multinational technology industry with a focus on trends in products and services
- **Content subject:** Focus on financial analysis and investment prospects for Apple
- **Context:** Provide insights for investment decision-making or portfolio management
- **Writing style:** Use a professional and analytical tone
- **Format:** Data should be presented in tabular format and the textual analysis to be displayed in paragraph form
- **Structure:** Organize the analysis into relevant sections (e.g., financial ratios, revenue growth, market share, etc.)
- **Supplementary details:** Include relevant financial statements or market research data
- **Voice:** Maintain a formal and objective voice throughout the analysis

By utilizing this investment analysis template, the financial analyst can ensure that the prompt is tailored specifically to Apple Inc., allowing for a focused and comprehensive financial evaluation. Utilizing prompt chains involves breaking down complex queries into a series of interconnected, simpler questions, allowing for more accurate responses and enhanced results. By guiding AI systems through a step-by-step process, prompt chains facilitate a clearer understanding of the query and enable more precise and comprehensive answers. Here are some additional tips for improving prompts and enhancing their quality:

- **Use prompt chains:** Instead of relying on a single prompt, consider using prompt chains. This involves breaking down complex tasks into smaller, sequential prompts. Each prompt builds upon the previous one, guiding the user towards the desired outcome. Prompt chains can help maintain clarity, provide structure, and increase engagement.
- **Incorporate linguistic and cultural context:** Consider the linguistic and cultural context of the analysis. Consider using appropriate terminology, idiomatic expressions, or cultural references that generate the type of response sought. This helps create a prompt that feels natural and relevant to the content, which is important for financial analysis which is heavy on jargons and technical terms.
- **Be clear and specific:** Ensure that prompts clearly communicate the desired task and objective. Avoid vague or ambiguous language that can lead to confusion. Be specific about the information, data, or analysis you require, providing clear instructions and guidelines. Clarity and specificity help users provide more accurate and focused responses.
- **Try different words and phrases:** If the first prompt does not produce the desired result, the user should continue using different words (nouns and verbs) to unlock

the topic being investigated. Playing around with different wording, tenses, and query structure can sometimes produce more meaningful results – it is advisable to try readjusting prompts.

Advanced Prompt Engineering

Prompt engineering involves employing advanced techniques and strategies to augment the effectiveness of prompts in generative AI for financial analysis beyond the fundamental principles of prompt writing. These advanced techniques focus on delivering enhanced context, guidance, and control to ensure more precise and tailored AI-generated responses. By incorporating techniques such as using specialized linguistic and financial terminology, providing specific examples, or leveraging pre-trained models, advanced prompt engineering empowers users to elicit more accurate and insightful analysis from the AI system. These strategies play a vital role in optimizing the quality and relevance of AI-generated financial analysis, enabling users to make informed decisions based on reliable and comprehensive insights.

System message prompts offer a valuable tool for financial professionals seeking to enhance the accuracy of chatbot responses in financial analysis. By utilizing system messages strategically, professionals can provide contextual information and instructions to guide the AI model. In the context of financial analysis, system messages can be employed to specify the desired output format, such as requesting responses in the form of a balance sheet, income statement, or cash flow statement. This deliberate instruction allows the AI model to understand the required output structure, resulting in more precise and tailored responses that align with the specific needs of the financial analysis process. By leveraging system messages, financial professionals can optimize the chatbot's

performance and generate insights that are directly applicable to their analytical requirements.

Temperature Parameters

These are a setting that can be adjusted when using generative AI models like chatbots. In the context of natural language generation, temperature determines the level of randomness or creativity in the generated text. It controls the probability distribution of word choices in the output.

A higher temperature value (e.g., 0.8) increases randomness and encourages the model to explore a wider range of options, resulting in more diverse and creative responses. This can lead to outputs that may be less predictable or more imaginative. Conversely, a lower temperature value (e.g., 0.2) reduces randomness and makes the model more focused and deterministic. This tends to generate responses that are more precise and aligned with the most probable choices according to the model's training data.

By adjusting the temperature parameter, users can customize the balance between creative and predictable outputs based on their specific needs and preferences. It offers a way to fine-tune the AI model's behavior and generate text that best fits the desired criteria for a given application, such as financial analysis. It is useful to play around with generative AI models to produce more diverse or accurate outputs by adjusting the temperature hyperparameter.

Temperature parameters play a crucial role in financial analysis when utilizing chatbots. By adjusting the temperature value, the type of answers generated can be controlled, impacting the level of randomness and creativity in AI-generated responses. Lower temperature values, such as 0.2, are beneficial for financial analysis that demands precise and well-defined responses. This choice promotes deterministic and accurate answers from the AI model, aligning with the requirement for focused insights.

Conversely, higher temperature values like 0.8 can be employed when exploring potential scenarios or seeking innovative ideas. By increasing the temperature, the chatbot's responses become more diverse and creative, allowing for out-of-the-box insights.

To ensure the optimal balance between precision and creativity, it is vital to consider the specific context and purpose of the financial analysis when adjusting the temperature parameter. By thoughtfully selecting the appropriate temperature value, financial professionals can fine-tune the chatbot's responses to meet their analytical needs effectively, be it generating precise and reliable insights or encouraging innovative thinking. Understanding and leveraging temperature parameters allow for greater control and customization of the AI-generated responses in financial analysis, thereby enhancing the overall analytical process.

Conclusion

Properly using prompts in generative AI for financial analysis is a valuable skill for financial professionals seeking to leverage AI-powered tools for data analysis, decision-making, and insights generation. This serves as a guide for the basics of prompts, the strengths of different AI chatbot systems, and effective strategies for crafting prompts specific to financial analysis tasks. By following the best practices outlined in this guide and employing advanced prompt engineering techniques, financial professionals can maximize the accuracy, relevance, and usefulness of AI-generated responses.

There are still areas for future research and improvement within the field of generative AI for financial analysis. One important area is the development of techniques to enhance the interpretability of AI-generated outputs, enabling users to better understand the reasoning and underlying factors behind the generated insights. Additionally, ongoing research into improving the ethical considerations and bias

mitigation strategies within generative AI systems is crucial to ensure fairness, transparency, and responsible use in financial decision-making.

As AI technology continues to advance, there will also be opportunities to explore the integration of real-time financial data and market conditions into generative AI models, enabling more dynamic and accurate analysis. Furthermore, exploring the potential of collaborative AI systems that combine the expertise of financial professionals with the capabilities of generative AI can lead to powerful synergies in financial analysis.

In conclusion, while prompt engineering and generative AI hold immense promise for financial analysis, continued research and development will drive innovation and address the challenges associated with AI technology in the financial domain. By embracing these advancements and continuing to refine AI systems, financial professionals can unlock new levels of efficiency, accuracy, and insights to navigate the complexities of the financial landscape.

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Appendix

ChatGPT response to “Compare the historical performance and financial ratios of Apple Inc. and Microsoft Corporation over the past five years, highlighting key differences in profitability, liquidity, and investment potential.”

To provide a comprehensive analysis of the historical performance and financial ratios of Apple Inc. and Microsoft Corporation over the past five years, I will present a comparison of their profitability, liquidity, and investment potential. Please note that the following information is based on historical data up until my knowledge cutoff in September 2021.

Profitability:

1. Net Profit Margin (NPM):

- Apple:
 - 2020: 21.69%
 - 2019: 21.24%
 - 2018: 22.41%
 - 2017: 21.21%
 - 2016: 21.20%
- Microsoft:
 - 2020: 32.54%
 - 2019: 31.47%
 - 2018: 23.44%
 - 2017: 25.51%
 - 2016: 20.68%

Microsoft has generally displayed higher net profit margins compared to Apple, indicating better profitability over the past five years.

2. Return on Assets (ROA):

- Apple:
 - 2020: 12.67%
 - 2019: 14.01%
 - 2018: 16.71%
 - 2017: 14.78%

- 2016: 14.13%
- Microsoft:
 - 2020: 15.57%
 - 2019: 13.80%
 - 2018: 11.90%
 - 2017: 11.49%
 - 2016: 9.88%

Apple has generally shown higher return on assets compared to Microsoft, indicating better utilization of its assets to generate profits.

Liquidity:

1. Current Ratio:

- Apple:
 - 2020: 1.36
 - 2019: 1.50
 - 2018: 1.12
 - 2017: 1.33
 - 2016: 1.35
- Microsoft:
 - 2020: 2.74
 - 2019: 2.67
 - 2018: 2.79
 - 2017: 2.60
 - 2016: 2.85

Microsoft consistently maintains a higher current ratio compared to Apple, indicating better short-term liquidity and ability to meet obligations.

2. Quick Ratio:

- Apple:
 - 2020: 1.01
 - 2019: 1.25
 - 2018: 0.93
 - 2017: 1.15
 - 2016: 1.24

- Microsoft:
 - 2020: 2.69
 - 2019: 2.62
 - 2018: 2.76
 - 2017: 2.57
 - 2016: 2.81

Similar to the current ratio, Microsoft maintains a higher quick ratio than Apple, indicating better short-term liquidity and ability to meet obligations without relying on inventory.

Investment Potential:

1. Price-to-Earnings (P/E) Ratio:

- Apple:
 - 2020: 34.99
 - 2019: 20.16
 - 2018: 17.86
 - 2017: 18.33
 - 2016: 12.80
- Microsoft:
 - 2020: 35.76
 - 2019: 30.68
 - 2018: 25.06
 - 2017: 28.89
 - 2016: 26.85

Both Apple and Microsoft have relatively high P/E ratios, indicating that investors have higher expectations for future earnings growth.

2. Dividend Yield:

- Apple:
 - 2020: 0.71%
 - 2019: 1.21%
 - 2018: 1.44%

- 2017: 1.57%
- 2016: 1.98%
- Microsoft:
 - 2020: 0.90%
 - 2019: 1.44%
 - 2018: 1.68%
 - 2017: 1.97%
 - 2016: 2.34%

Both companies offer dividends, but Apple has generally had a lower dividend yield compared to Microsoft.

Overall, Microsoft has displayed better profitability and liquidity ratios over the past five years, while Apple has shown higher return on assets. Both companies have investment potential, as indicated by their relatively high P/E ratios, but Apple has had a lower dividend yield. It is important to conduct further research and analysis, including considering recent financial updates and market conditions, to make informed investment decisions.

Bard AI response to “Compare the historical performance and financial ratios of Apple Inc. and Microsoft Corporation over the past five years, highlighting key differences in profitability, liquidity, and investment potential.”

Here is a comparison of the historical performance and financial ratios of Apple Inc. and Microsoft Corporation over the past five years, highlighting key differences in profitability, liquidity, and investment potential:

Metric	Apple Inc.	Microsoft Corporation
Revenue	\$365.82 billion (2022)	\$168.09 billion (2022)
Net income	\$94.68 billion (2022)	\$68.95 billion (2022)
Profit margin	25.8% (2022)	41.1% (2022)
Return on equity	65.6% (2022)	43.6% (2022)
Current ratio	1.91 (2022)	1.32 (2022)
Quick ratio	1.12 (2022)	0.85 (2022)
Debt-to-equity ratio	0.38 (2022)	0.27 (2022)
Price-to-earnings ratio	23.29 (2023-02-14)	25.90 (2023-02-14)
Price-to-book ratio	6.42 (2023-02-14)	5.78 (2023-02-14)

As you can see, Apple Inc. has been more profitable than Microsoft Corporation over the past five years. Apple Inc. also has a higher profit margin, return on equity, and price-to-earnings ratio. However, Microsoft Corporation has a higher current ratio, quick ratio, and debt-to-equity ratio.

Overall, Apple Inc. appears to be a more profitable company than Microsoft Corporation. However, Microsoft Corporation may be a better investment for investors who are looking for a more liquid company with a lower debt load. Here are some additional details about each company:

- Apple Inc. is a multinational technology company that designs, develops, and sells consumer electronics, computer software, and online services. Apple is one of the Big Five American information technology companies, with Amazon, Google, Meta, and Microsoft being the others.
- Microsoft Corporation is an American multinational technology company that develops, manufactures, licenses, supports, and sells computer software, consumer electronics, personal computers, and related services. Microsoft is one of the Big Five American information technology companies, with Amazon, Apple, Google, and Meta being the others.

Both Apple Inc. and Microsoft Corporation are large, successful companies with a long history of profitability. However, there are some key differences between the two companies. Apple Inc. is more focused on consumer electronics, while Microsoft Corporation is more focused on software and services. Apple Inc. also has a higher profit margin and return on equity, while Microsoft Corporation has a higher current ratio, quick ratio, and debt-to-equity ratio. Ultimately, the best investment for you will depend on your individual investment goals and risk tolerance. If you are looking for a company with a long history of profitability and a high profit margin, Apple Inc. may be a good option for you. If you are looking for a company with a strong balance sheet and a low debt load, Microsoft Corporation may be a better option for you.

Bing AI response to “Compare the historical performance and financial ratios of Apple Inc. and Microsoft Corporation over the past five years, highlighting key differences in profitability, liquidity, and investment potential.”

Over the past five years, Microsoft has increased its gross profit on an annual basis by \$57.48 billion (98.47%) at an annual growth rate of 14.78% ³. In contrast, Apple has increased its annual revenue by \$131.52 billion (57.37%) at an average annual growth rate of 10.42% ³.

Source: Conversation with Bing, 5/18/2023

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(3) Apple Financial Ratios for Analysis 2009-2023 | AAPL.

<https://www.macrotrends.net/stocks/charts/AAPL/apple/financial-ratios>.

In the past five years, both Apple and Microsoft have reported record-breaking profits. Apple made a \$21.7bn profit for the three-month period that ended in June, its best fiscal third quarter in its 45-year history, boosted by strong sales of the iPhone 12 and growth in its services business ¹. Microsoft has also consistently generated high EBITDA margins of 47.99% combined with a 5Y average ROIC of 25% ³. In FY22, Microsoft generated \$198B in revenue, representing a growth of 18% compared to the previous year with the firm’s total revenues having grown a whopping 106% since FY17 ³.

Source: Conversation with Bing, 5/18/2023

- (1) Google, Apple, and Microsoft report record-breaking profits.
<https://www.theguardian.com/technology/2021/jul/27/google-apple-and-microsoft-to-report-record-breaking-profits>.
- (2) Microsoft: Profitability Powerhouse Set for Long-Term Gains.
<https://seekingalpha.com/article/4583237-microsoft-profitability-powerhouse-set-for-long-term-gains>.
- (3) Microsoft (MSFT) Vs. Apple (AAPL): Updated Comparison After H1 2021.
<https://seekingalpha.com/article/4452489-microsoft-apple-updated-comparison-first-half-2021>.
- (4) Better Buy: Apple vs. Microsoft | The Motley Fool.
<https://www.fool.com/investing/2021/03/13/better-buy-apple-vs-microsoft/>.
- (5) Apple Inc. (NASDAQ: AAPL) | Analysis of Profitability Ratios. <https://www.stock-analysis-on.net>.

Apple holds \$195.6 billion in cash on hand, offset by \$112 billion in various forms of debt ³. Over the trailing 12 months, it generated \$80.2 billion in free cash flow ³. In comparison, Microsoft holds about \$132 billion in cash, against \$60.5 billion in total debt ³. Free cash flow for the company came in at about \$50.4 billion over the previous 12 months ³.

Source: Conversation with Bing, 5/18/2023

- (1) Better Buy: Apple vs. Microsoft | The Motley Fool.
<https://www.fool.com/investing/2021/03/13/better-buy-apple-vs-microsoft/>.
- (2) Apple Inc. (NASDAQ: AAPL) | Analysis of Liquidity Ratios. <https://www.stock-analysis-on.net/NASDAQ/Company/Apple-Inc/Ratios/Liquidity>.
- (3) Apple Current Ratio 2010-2023 | AAPL | MacroTrends.
<https://www.macrotrends.net/stocks/charts/AAPL/apple/current-ratio.net/NASDAQ/Company/Apple-Inc/Ratios/Profitability>.

Both Apple and Microsoft have been experiencing revenue growth despite inflation and other macroeconomic headwinds ². Apple's iconic hardware products remain popular, hitting record adoption levels in its fiscal third quarter ². Microsoft's cloud offerings

helped the company accelerate revenue growth over the last two fiscal years ². In terms of stock performance, earlier investors in MSFT stock have had every reason to celebrate over the past five years. Shares have risen by over 245%, from \$72.68 in July 2017 to \$253.21 at the time of writing on 2 December 2022 ⁴.

Source: Conversation with Bing, 5/18/2023

(1) Apple vs Microsoft: Which Stock Is the Better Long-Term Investment

<https://www.fool.com/investing/2022/09/07/apple-vs-microsoft-which-stock-is-the-better-long/>.

(2) Microsoft Stock Price in 5 Years | Microsoft 5 Year Stock Forecast.

<https://capital.com/microsoft-stock-five-year-forecast>.

(3) Will Microsoft Be Worth More Than Apple by 2025?.

<https://www.fool.com/investing/2022/09/23/will-microsoft-be-worth-more-than-apple-by-2025/>.

(4) Today in Apple history: Microsoft investment helps save Apple - Cult of Mac.

<https://www.cultofmac.com/567497/microsoft-investment-saves-apple/>.

Apple has announced a massive plan to become carbon-neutral across its entire business, including manufacturing, by 2030 ¹. It also announced a new recycling robot that will extract rare-earth metals from one of the most fragile systems in the iPhone ¹. Apple has also been integrating augmented reality into its devices for years and it looks like the company will jump right into the territory of Meta, Microsoft, and Magic Leap with a long-expected mixed-reality headset in 2023 ⁴.

Microsoft has been expanding its cloud-based services while reducing its dependence on desktop software ¹. Microsoft developed more mobile apps for iOS and Android, launched new Surface devices, expanded its Xbox gaming business, and abandoned its struggling Windows Phone platform ¹.

Source: Conversation with Bing, 5/18/2023

- (1) Apple Sets Climate Goals for 2030, Joins Amazon and Microsoft.
<https://www.wired.com/story/apple-sets-climate-goals-for-2030/>.
- (2) Apple's Mixed Reality Headset: What to Expect in 2023 - CNET.
<https://www.cnet.com/tech/computing/apple-ar-vr-headset-rumors-2023/>.
- (3) Tim Cook Reveals Apple's 10-Year Plan for Future Tech. <https://futurism.com/tim-cook-reveals-apples-10-year-plan-for-future-tech>.
- (4) Apple, Google and Microsoft Commit to Expanded Support for FIDO
<https://fidoalliance.org/apple-google-and-microsoft-commit-to-expanded-support-for-fido-standard-to-accelerate-availability-of-passwordless-sign-ins/>.
- (5) The Metaverse Set Off A Battle Between Tech Giants Google, Apple
<https://www.forbes.com/sites/jackkelly/2022/01/21/the-metaverse-set-off-a-battle-between-tech-giants-google-apple-microsoft-and-meta-to-build-virtual-and-augmented-reality-headsets/>.