

```

With arguments: {'ticker': 'AAPL'}
Tool Result (get_fundamentals):
Arguments: {'ticker': 'AAPL'}
Output: Ratios extracted for AAPL.
Planning to use tools: ['handoff']
Calling Tool: handoff
With arguments: {'to_agent': 'ProfitabilityAgent', 'reason': "Profitability ratios are needed to provide a comprehensive analysis and comments on Apple's financial health."}
Tool Result (handoff):
Arguments: {'to_agent': 'ProfitabilityAgent', 'reason': "Profitability ratios are needed to provide a comprehensive analysis and comments on Apple's financial health."}
Output: Agent ProfitabilityAgent is now handling the request due to the following reason: Profitability ratios are needed to provide a comprehensive analysis and comments on Apple's financial health..
Please continue with the current request.
=====
```

```

Agent: ProfitabilityAgent
=====
Planning to use tools: ['get_profitability_ratios']
Calling Tool: get_profitability_ratios
With arguments: {}
Tool Result (get_profitability_ratios):
Arguments: {}
Output: Profitability ratios extracted and Comments performed: To analyze the financial health of Apple Inc. (AAPL) based on its profitability ratios, we will evaluate each ratio against the provided thresholds and assign a score from 1 to 10. This score will reflect the health of each ratio, with 1 being very unhealthy and 10 being very healthy. Let's proceed with the analysis:
```

```

### 1 Return on Assets (ROA)
- **Value**: 26.13%
- **Thresholds**:
  - Healthy: > 5%
  - Moderate: 2% - 5%
  - Weak: < 2%
```

**Score**: 10/10

**Justification**: Apple's ROA of 26.13% is significantly above the healthy threshold of 5%. This indicates that the company is highly efficient in using its assets to generate earnings. A high ROA suggests strong operational efficiency and effective asset management, which is a positive indicator of financial health.

### ### 2 Return on Equity (ROE)

- \*\*Value\*\*: 157.41%
- \*\*Thresholds\*\*:
  - Healthy: > 15%
  - Moderate: 8% - 15%
  - Weak: < 8%

\*\*Score\*\*: 10/10

\*\*Justification\*\*: With an ROE of 157.41%, Apple far exceeds the healthy threshold of 15%. This exceptionally high ROE indicates that the company is generating substantial profits from its shareholders' equity. It reflects strong profitability and effective use of equity financing, showcasing Apple's ability to deliver high returns to its investors.

### ### 3 Net Profit Margin

- \*\*Value\*\*: 23.97%
- \*\*Thresholds\*\*:
  - Healthy: > 10%
  - Moderate: 5% - 10%
  - Weak: < 5%

\*\*Score\*\*: 10/10

\*\*Justification\*\*: Apple's net profit margin of 23.97% is well above the healthy threshold of 10%. This high margin indicates that the company retains a significant portion of its revenue as profit after all expenses. It reflects strong cost management and pricing power, contributing to robust profitability.

### ### 4 Gross Margin

- \*\*Value\*\*: 46.21%
- \*\*Thresholds\*\*:
  - Healthy: > 40%
  - Moderate: 20% - 40%
  - Weak: < 20%

\*\*Score\*\*: 10/10

\*\*Justification\*\*: The gross margin of 46.21% is above the healthy threshold of 40%. This indicates that Apple is efficiently managing its production costs relative to its sales, allowing for a substantial portion of revenue to cover operating expenses and contribute to profit. A high gross margin is indicative of strong competitive positioning and cost control.

## ### Overall Insight on Financial Health

\*\*Summary\*\*: Apple's financial health, as assessed through its profitability ratios, is exceptionally strong. Each ratio not only meets but significantly

exceeds the healthy thresholds, earning the maximum score of 10. This reflects Apple's robust operational efficiency, effective asset and equity management, strong cost control, and high profitability. The company's ability to generate substantial returns on assets and equity, coupled with high profit margins, underscores its financial strength and competitive advantage in the market. There are no apparent weaknesses in the profitability ratios, indicating a very healthy financial position.

Planning to use tools: ['handoff']

Calling Tool: handoff

With arguments: {'to\_agent': 'LiquidityAgent', 'reason': "Profitability ratio comments for Apple are complete. Next, liquidity ratios are needed to further assess the company's financial health."}

Tool Result (handoff):

Arguments: {'to\_agent': 'LiquidityAgent', 'reason': "Profitability ratio comments for Apple are complete. Next, liquidity ratios are needed to further assess the company's financial health."}

Output: Agent LiquidityAgent is now handling the request due to the following reason: Profitability ratio comments for Apple are complete. Next, liquidity ratios are needed to further assess the company's financial health.. Please continue with the current request.

=====

Agent: LiquidityAgent

=====

Planning to use tools: ['get\_liquidity\_ratios']

Calling Tool: get\_liquidity\_ratios

With arguments: {}

Tool Result (get\_liquidity\_ratios):

Arguments: {}

Output: Liquidity ratios extracted and Comments performed: To analyze the financial health of Apple Inc. (AAPL) based on the provided profitability ratios, we will evaluate each ratio against the given thresholds, assign a score from 1 to 10, and provide justifications for these scores. Finally, we will summarize the overall financial health of the firm.

### 1. Current Ratio

- \*\*Value\*\*: 0.8673
- \*\*Healthy Range\*\*: 1.5 - 3.0
- \*\*Analysis\*\*: The current ratio of 0.8673 is below the healthy range, indicating that Apple may not have enough current assets to cover its current liabilities. This suggests potential liquidity issues.
- \*\*Score\*\*: 3/10
- \*\*Justification\*\*: The score reflects the fact that the ratio is in the warning zone, indicating a potential liquidity concern. However, it is not in the risky/dangerous zone, which would warrant a lower score.

### 2. Quick Ratio

- **Value**: 0.5589
- **Healthy Range**: > 1.0
- **Analysis**: The quick ratio is significantly below the healthy threshold, suggesting that Apple may struggle to meet its short-term obligations without relying on inventory sales.
- **Score**: 2/10
- **Justification**: The quick ratio is well below the healthy range, indicating a potential liquidity risk. This warrants a low score as it suggests a reliance on inventory to meet short-term liabilities.

### ### 3. Debt-to-Equity Ratio

- **Value**: 2.0906
- **Healthy Range**: 0.3 - 1.5
- **Analysis**: The debt-to-equity ratio is above the healthy range and in the warning zone, indicating that Apple is using a higher level of debt financing relative to equity. This could imply higher financial risk.
- **Score**: 4/10
- **Justification**: The score reflects the fact that the ratio is above the healthy range but not in the risky/dangerous zone. While it indicates higher leverage, it is not excessively high.

### ### 4. Interest Coverage Ratio

- **Value**: Infinity (inf)
- **Healthy Range**: > 3.0
- **Analysis**: An infinite interest coverage ratio suggests that Apple has no interest expense or that its earnings are significantly higher than its interest obligations, indicating excellent financial health in terms of covering interest expenses.
- **Score**: 10/10
- **Justification**: The infinite interest coverage ratio is a strong indicator of financial health, as it suggests that Apple can easily cover its interest obligations, reflecting a very healthy position.

### ### Overall Insight on Financial Health

- **Strengths**: The infinite interest coverage ratio is a significant strength, indicating that Apple has no issues covering its interest expenses, which is a positive sign of financial stability.
- **Weaknesses**: The current and quick ratios are below the healthy thresholds, suggesting potential liquidity concerns. Additionally, the debt-to-equity ratio is in the warning zone, indicating higher leverage and potential financial risk.
- **Summary**: While Apple demonstrates strong financial health in terms of interest coverage, its liquidity ratios suggest potential short-term financial challenges. The high debt-to-equity ratio indicates a reliance on debt financing, which could pose risks if not managed carefully. Overall, Apple appears financially stable but should monitor its liquidity and leverage to maintain its financial health.

Planning to use tools: ['handoff']

Calling Tool: handoff

With arguments: {'to\_agent': 'SupervisorAgent', 'reason': 'Liquidity ratio comments for Apple are complete. SupervisorAgent should now provide an overall comment based on both profitability and liquidity comments.'}

Tool Result (handoff):

Arguments: {'to\_agent': 'SupervisorAgent', 'reason': 'Liquidity ratio comments for Apple are complete. SupervisorAgent should now provide an overall comment based on both profitability and liquidity comments.'}

Output: Agent SupervisorAgent is now handling the request due to the following reason: Liquidity ratio comments for Apple are complete. SupervisorAgent should now provide an overall comment based on both profitability and liquidity comments..

Please continue with the current request.

=====

Agent: SupervisorAgent

=====

Planning to use tools: ['get\_overall\_comments']

Calling Tool: get\_overall\_comments

With arguments: {'overall\_comments': 'Apple Inc. demonstrates exceptional profitability, with all key profitability ratios (ROA, ROE, Net Profit Margin, Gross Margin) significantly exceeding healthy thresholds. This reflects outstanding operational efficiency, strong cost management, and the ability to generate high returns for shareholders. However, liquidity ratios (Current Ratio and Quick Ratio) are below healthy ranges, indicating potential short-term liquidity concerns. The Debt-to-Equity Ratio is above the healthy range, suggesting higher leverage, but the infinite Interest Coverage Ratio shows Apple has no difficulty meeting its interest obligations. Overall, Apple is in robust financial health due to its strong profitability and ability to cover debt costs, but it should monitor liquidity and leverage to avoid potential short-term financial stress.'}

Tool Result (get\_overall\_comments):

Arguments: {'overall\_comments': 'Apple Inc. demonstrates exceptional profitability, with all key profitability ratios (ROA, ROE, Net Profit Margin, Gross Margin) significantly exceeding healthy thresholds. This reflects outstanding operational efficiency, strong cost management, and the ability to generate high returns for shareholders. However, liquidity ratios (Current Ratio and Quick Ratio) are below healthy ranges, indicating potential short-term liquidity concerns. The Debt-to-Equity Ratio is above the healthy range, suggesting higher leverage, but the infinite Interest Coverage Ratio shows Apple has no difficulty meeting its interest obligations. Overall, Apple is in robust financial health due to its strong profitability and ability to cover debt costs, but it should monitor liquidity and leverage to avoid potential short-term financial stress.'}

Output: bad operand type for unary ~: 'CompletionResponse'

Output: Apple Inc. displays outstanding financial health from a profitability perspective, with all major profitability ratios-Return on Assets (ROA: 26.13%), Return on Equity (ROE: 157.41%), Net Profit Margin (23.97%), and Gross Margin

(46.21%)—far exceeding healthy thresholds. This indicates Apple is highly efficient in generating profits from its assets and equity, has strong cost control, and delivers substantial returns to shareholders.

On the liquidity side, however, there are some areas of concern. The Current Ratio (0.87) and Quick Ratio (0.56) are both below healthy levels, suggesting Apple may not have enough liquid assets to cover its short-term liabilities. The Debt-to-Equity Ratio (2.09) is above the healthy range, indicating higher leverage and reliance on debt financing. Despite this, Apple's Interest Coverage Ratio is infinite, meaning it has no trouble covering its interest expenses, which is a strong sign of financial stability.

In summary, Apple's exceptional profitability and ability to cover debt costs outweigh its short-term liquidity concerns. The company is fundamentally strong, but it should continue to monitor its liquidity and leverage to ensure ongoing financial resilience.

### 5.5.3 Output:

Apple Inc. displays outstanding financial health from a profitability perspective, with all major profitability ratios—Return on Assets (ROA: 26.13%), Return on Equity (ROE: 157.41%), Net Profit Margin (23.97%), and Gross Margin (46.21%)—far exceeding healthy thresholds. This indicates Apple is highly efficient in generating profits from its assets and equity, has strong cost control, and delivers substantial returns to shareholders.

On the liquidity side, however, there are some areas of concern. The Current Ratio (0.87) and Quick Ratio (0.56) are both below healthy levels, suggesting Apple may not have enough liquid assets to cover its short-term liabilities. The Debt-to-Equity Ratio (2.09) is above the healthy range, indicating higher leverage and reliance on debt financing. Despite this, Apple's Interest Coverage Ratio is infinite, meaning it has no trouble covering its interest expenses, which is a strong sign of financial stability.

In summary, Apple's exceptional profitability and ability to cover debt costs outweigh its short-term liquidity concerns. The company is fundamentally strong, but it should continue to monitor its liquidity and leverage to ensure ongoing financial resilience.

## 5.6 LLM:GPT-4.5-Preview

### Agents and Workflow

```
[ ]: from llama_index.core.agent.workflow import FunctionAgent

fundamental_agent = FunctionAgent(
    name="FundamentalAgent",
    description="Get various fundamental ratios for a given ticker.",
    system_prompt=(
        "You are the fundamental analyst that can extract different fundamental ratios for a given ticker. "
```

```

    "Once you have extracted the fundamental financial ratios, you should
    ↵hand off control to the ProfitabilityAgent to extract the profitability
    ↵ratios or/and the LiquidityAgent to extract the liquidity ratios."
)

profitability_agent = FunctionAgent(
    name="ProfitabilityAgent",
    description="Collect profitability ratios for a given ticker: ROA, ROE, Net
    ↵Profit Margin and Gross Margin and Comment on the results given a set of
    ↵threshold values.",
    system_prompt=(
        """You are the ProfitabilityAgent that can collect profitability ratios
        ↵(profitability_ratios) on a given ticker.

        You collect these ratios from the FundamentalAgent.

        Once these ratios are collected in profitability_ratios, you should
        ↵comment on these ratios based on the thresholds values provided in
        ↵get_profitability_ratios.

        These comments must be included in threshold_profitability_comments. At
        ↵the end provide ONLY these comments included in
        ↵threshold_profitability_comments. DO NOT ADD anything else.

        Once the comments are done, you should hand off control to the
        ↵LiquidityAgent.

        """
),
    llm=LLM_45,
    tools=[get_profitability_ratios],
    can_handoff_to=["LiquidityAgent"],
)

liquidity_agent = FunctionAgent(
    name="LiquidityAgent",
    description="Collect liquidity ratios for a given ticker: Current Ratio,
    ↵Quick Ratio, Debt-to-Equity Ratio, Interest Coverage Ratio and comments on
    ↵these ratios given a set of threshold values.",
    system_prompt=(
        """You are the LiquidityAgent that can collect liquidity ratios
        ↵(liquidity_ratios) on a given ticker.

        You collect these ratios from the FundamentalAgent.

        Once these ratios are collected in liquidity_ratios, you should comment
        ↵on these ratios based on the thresholds values provided in
        ↵get_liquidity_ratios.

```

```

These comments must be included in threshold_liquidity_comments. At the
end provide ONLY these comments included in threshold_liquidity_comments. DO
NOT ADD anything else.

Once the comments are done, you should hand off control to the
SupervisorAgent.

"""

),
llm=LLM_45,
tools=[get_liquidity_ratios],
can_handoff_to=["SupervisorAgent"],
)

supervisor_agent = FunctionAgent(
    name="SupervisorAgent",
    description="Provide an overall comment based on the comments coming from
the ProfitabilityAgent and LiquidityAgent and stored on overall_comments.",
    system_prompt=(
        "You are an fundamental analyst expert and supervisor. You collect
comments coming from various agents such as ProfitabilityAgent and
LiquidityAgent. "
        "If you collect only one or no comments, go back to ProfitabilityAgent
and LiquidityAgent until you get the desired feedbacks on the ratios."
        "If you don't collect threshold_liquidity_comments, you should hand off
control to the LiquidityAgent to gather these comments."
        "If you don't collect threshold_profitability_comments, you should hand
off control to the ProfitabilityAgent to gather these comments."
        "Based on the results in the comments coming from the
ProfitabilityAgent and LiquidityAgent, provide an overall comment on the
health of the firm."
        "Justify your comment with details and data. "
),
llm=LLM_45,
tools=[get_overall_comments],
can_handoff_to=["FundamentalAgent","ProfitabilityAgent","LiquidityAgent"],
)

```

```
[ ]: # from llama_index.core.agent.workflow import AgentWorkflow
```

```

agent_workflow = AgentWorkflow(
    agents=[fundamental_agent, profitability_agent, liquidity_agent,
supervisor_agent],
    root_agent=fundamental_agent.name,
    initial_state={
        "ratios": pd.DataFrame(),
        "profitability_ratios": {},
        "liquidity_ratios": {},
    }
)
```

```

        "threshold_profitability_comments": None,
        "threshold_liquidity_comments": None,
        "overall_comments": None,
        "ticker": "",
    },
}

)

```

## Launch Workflow

```

[ ]: # from llama_index.core.agent.workflow import (
#     AgentInput,
#     AgentOutput,
#     ToolCall,
#     ToolCallResult,
#     AgentStream,
# )

handler = agent_workflow.run(
    user_msg=(
        "Provide the fundamental analysis of Apple and comments on the"
        "financial health of the company."
    )
)

current_agent = None
current_tool_calls = ""
async for event in handler.stream_events():
    if (
        hasattr(event, "current_agent_name")
        and event.current_agent_name != current_agent
    ):
        current_agent = event.current_agent_name
        print(f"\n{'='*50}")
        print(f" Agent: {current_agent}")
        print(f"{'='*50}\n")

    elif isinstance(event, AgentOutput):
        if event.response.content:
            print(" Output:", event.response.content)
        if event.tool_calls:
            print(
                " Planning to use tools:",
                [call.tool_name for call in event.tool_calls],
            )
    elif isinstance(event, ToolCallResult):
        print(f" Tool Result ({event.tool_name}):")

```

```

        print(f" Arguments: {event.tool_kwargs}")
        print(f" Output: {event.tool_output}")
    elif isinstance(event, ToolCall):
        print(f" Calling Tool: {event.tool_name}")
        print(f" With arguments: {event.tool_kwargs}")

```

```
=====
Agent: FundamentalAgent
=====

Planning to use tools: ['get_fundamentals']

Obtaining financial statements: 100%|      3/3 [00:00<00:00, 5.01it/s]
Obtaining historical data: 100%|      2/2 [00:00<00:00, 9.63it/s]

ratios 2022      NaN
2023      0.275
2024      0.2613
Freq: Y-DEC, Name: Return on Assets, dtype: float64
Calling Tool: get_fundamentals
With arguments: {'ticker': 'AAPL'}
Tool Result (get_fundamentals):
Arguments: {'ticker': 'AAPL'}
Output: Ratios extracted for AAPL.
Planning to use tools: ['handoff', 'handoff']
Calling Tool: handoff
With arguments: {'to_agent': 'ProfitabilityAgent', 'reason': 'Extract profitability ratios for Apple and provide comments based on threshold values.'}
Tool Result (handoff):
Arguments: {'to_agent': 'ProfitabilityAgent', 'reason': 'Extract profitability ratios for Apple and provide comments based on threshold values.'}
Output: Agent ProfitabilityAgent is now handling the request due to the following reason: Extract profitability ratios for Apple and provide comments based on threshold values..
Please continue with the current request.
Calling Tool: handoff
With arguments: {'to_agent': 'LiquidityAgent', 'reason': 'Extract liquidity ratios for Apple and provide comments based on threshold values.'}
Tool Result (handoff):
Arguments: {'to_agent': 'LiquidityAgent', 'reason': 'Extract liquidity ratios for Apple and provide comments based on threshold values.'}
Output: Agent LiquidityAgent cannot hand off to FundamentalAgent. Please select a valid agent to hand off to.

=====
Agent: ProfitabilityAgent
=====
```

```
Planning to use tools: ['get_profitability_ratios']
Calling Tool: get_profitability_ratios
With arguments: {}
Tool Result (get_profitability_ratios):
Arguments: {}
Output: Profitability ratios extracted and Comments performed: To analyze the financial health of Apple Inc. (AAPL) based on its profitability ratios, we will evaluate each ratio against the provided thresholds and assign a score from 1 to 10. This score will reflect the health of each ratio, with 1 being very unhealthy and 10 being very healthy. Let's proceed with the analysis:
```

### ### 1 Return on Assets (ROA)

- \*\*Value\*\*: 26.13%
- \*\*Thresholds\*\*:
  - Healthy: > 5%
  - Moderate: 2% - 5%
  - Weak: < 2%

\*\*Score\*\*: 10/10

\*\*Justification\*\*: Apple's ROA of 26.13% is significantly above the healthy threshold of 5%. This indicates that Apple is highly efficient in using its assets to generate earnings. A high ROA suggests strong operational efficiency and effective asset management, which is a positive indicator of financial health.

### ### 2 Return on Equity (ROE)

- \*\*Value\*\*: 157.41%
- \*\*Thresholds\*\*:
  - Healthy: > 15%
  - Moderate: 8% - 15%
  - Weak: < 8%

\*\*Score\*\*: 10/10

\*\*Justification\*\*: With an ROE of 157.41%, Apple far exceeds the healthy threshold of 15%. This exceptionally high ROE indicates that the company is generating substantial profits from its shareholders' equity, reflecting strong profitability and effective use of equity capital. Such a high ROE is indicative of a company with a robust business model and strong competitive advantages.

### ### 3 Net Profit Margin

- \*\*Value\*\*: 23.97%
- \*\*Thresholds\*\*:

- Healthy: > 10%
- Moderate: 5% - 10%
- Weak: < 5%

**\*\*Score\*\*:** 10/10

**\*\*Justification\*\*:** Apple's net profit margin of 23.97% is well above the healthy threshold of 10%. This high margin indicates that Apple retains a significant portion of its revenue as profit after all expenses, showcasing strong cost management and pricing power. A high net profit margin is a sign of a financially healthy company with efficient operations.

### ### 4 Gross Margin

- **\*\*Value\*\*:** 46.21%
- **\*\*Thresholds\*\*:**
  - Healthy: > 40%
  - Moderate: 20% - 40%
  - Weak: < 20%

**\*\*Score\*\*:** 10/10

**\*\*Justification\*\*:** Apple's gross margin of 46.21% is above the healthy threshold of 40%. This indicates that Apple is able to maintain a substantial difference between its revenue and the cost of goods sold, reflecting strong pricing strategies and cost control. A high gross margin is a positive indicator of a company's ability to generate profit from its core activities.

### ### Overall Insight

Apple Inc. demonstrates exceptional financial health based on its profitability ratios. Each ratio not only meets but significantly exceeds the healthy thresholds, earning the highest possible scores. The company's strengths lie in its ability to efficiently utilize assets, generate substantial returns on equity, maintain high profit margins, and effectively manage costs. These factors collectively indicate a robust financial position, strong operational efficiency, and a competitive edge in the market. There are no apparent weaknesses in the profitability aspect of Apple's financial health, suggesting that the company is well-positioned for sustained profitability and growth.

Output: **### Profitability Analysis Comments for Apple Inc. (AAPL):**

1. **\*\*Return on Assets (ROA)\*\*:** Apple's ROA of 26.13% significantly exceeds the healthy threshold of 5%, indicating exceptional efficiency in asset utilization and strong operational management.

2. **\*\*Return on Equity (ROE)\*\*:** With an ROE of 157.41%, Apple far surpasses the healthy benchmark of 15%, reflecting outstanding profitability and effective equity management.

3. \*\*Net Profit Margin\*\*: Apple's net profit margin of 23.97% is well above the healthy threshold of 10%, demonstrating excellent cost management and strong pricing power.

4. \*\*Gross Margin\*\*: The gross margin of 46.21% exceeds the healthy threshold of 40%, highlighting Apple's effective cost control and robust pricing strategies.

### Overall Profitability Insight:

Apple Inc. exhibits exceptional financial health in terms of profitability. All profitability ratios significantly exceed healthy thresholds, indicating strong operational efficiency, effective asset and equity management, and robust profitability. This positions Apple favorably for sustained growth and profitability.

Now, handing off control to the LiquidityAgent for further analysis.

Planning to use tools: ['handoff']

Calling Tool: handoff

With arguments: {'to\_agent': 'LiquidityAgent', 'reason': 'Proceed to analyze liquidity ratios for Apple and provide comments based on threshold values.'}

Tool Result (handoff):

Arguments: {'to\_agent': 'LiquidityAgent', 'reason': 'Proceed to analyze liquidity ratios for Apple and provide comments based on threshold values.'}

Output: Agent LiquidityAgent is now handling the request due to the following reason: Proceed to analyze liquidity ratios for Apple and provide comments based on threshold values..

Please continue with the current request.

=====

Agent: LiquidityAgent

=====

Planning to use tools: ['get\_liquidity\_ratios']

Calling Tool: get\_liquidity\_ratios

With arguments: {}

Tool Result (get\_liquidity\_ratios):

Arguments: {}

Output: Liquidity ratios extracted and Comments performed: To analyze the financial health of Apple Inc. (AAPL) based on the provided profitability ratios, we will evaluate each ratio against the given thresholds, assign a score from 1 to 10, and provide a justification for each score. Finally, we will summarize the overall financial health of the firm.

### 1 Current Ratio

- \*\*Value\*\*: 0.8673
- \*\*Healthy Range\*\*: 1.5 - 3.0
- \*\*Score\*\*: 3/10

**\*\*Justification\*\*:**

The current ratio of 0.8673 is below the healthy range, indicating that Apple may not have sufficient current assets to cover its current liabilities. This suggests potential liquidity issues, as the company might struggle to meet short-term obligations. The score reflects the fact that the ratio is in the warning zone, but not critically low.

**### 2 Quick Ratio**

- **Value\*\*:** 0.5589
- **Healthy Range\*\*:** > 1.0
- **Score\*\*:** 2/10

**\*\*Justification\*\*:**

The quick ratio of 0.5589 is significantly below the healthy threshold of 1.0. This indicates that Apple may not have enough liquid assets (excluding inventory) to cover its current liabilities, which is a concern for its short-term financial health. The score is low because the ratio is well below the healthy range, suggesting potential liquidity challenges.

**### 3 Debt-to-Equity Ratio**

- **Value\*\*:** 2.0906
- **Healthy Range\*\*:** 0.3 - 1.5
- **Score\*\*:** 4/10

**\*\*Justification\*\*:**

The debt-to-equity ratio of 2.0906 is above the healthy range and falls into the warning zone. This suggests that Apple is using a higher level of debt relative to equity, which could increase financial risk. However, it is not in the risky/dangerous zone, and Apple's strong market position might mitigate some concerns. The score reflects the elevated risk but acknowledges that it is not critically high.

**### 4 Interest Coverage Ratio**

- **Value\*\*:** Infinity (inf)
- **Healthy Range\*\*:** > 3.0
- **Score\*\*:** 10/10

**\*\*Justification\*\*:**

An infinite interest coverage ratio indicates that Apple has no difficulty covering its interest expenses, likely due to substantial earnings relative to interest obligations. This is an excellent indicator of financial health in terms of managing debt costs, and the score reflects this strong position.

**### Overall Insight on Apple's Financial Health**

**\*\*Strengths\*\*:**

- **Interest Coverage**: Apple demonstrates exceptional ability to cover interest expenses, indicating strong earnings and effective debt management.

**\*\*Weaknesses\*\*:**

- **Liquidity Ratios**: Both the current and quick ratios are below healthy thresholds, suggesting potential liquidity issues. This could be a concern if Apple faces unexpected short-term financial obligations.
- **Debt-to-Equity Ratio**: While not critically high, the elevated debt-to-equity ratio indicates a reliance on debt financing, which could pose risks if not managed carefully.

**\*\*Summary\*\*:**

Apple's financial health presents a mixed picture. While the company excels in covering its interest expenses, indicating robust earnings, its liquidity ratios suggest potential short-term financial challenges. The elevated debt-to-equity ratio points to a reliance on debt, which could increase financial risk. Overall, while Apple's earnings power is strong, attention to liquidity management and debt levels is advisable to ensure long-term financial stability.

Output: ### Liquidity Analysis Comments for Apple Inc. (AAPL):

1. **Current Ratio**: Apple's current ratio of 0.8673 is below the healthy range (1.5 - 3.0), indicating potential liquidity issues and difficulty in meeting short-term obligations.
2. **Quick Ratio**: The quick ratio of 0.5589 is significantly below the healthy threshold (>1.0), suggesting insufficient liquid assets to cover immediate liabilities, raising concerns about short-term financial stability.
3. **Debt-to-Equity Ratio**: With a debt-to-equity ratio of 2.0906, Apple is above the healthy range (0.3 - 1.5), indicating a higher reliance on debt financing, which could increase financial risk.
4. **Interest Coverage Ratio**: Apple's infinite interest coverage ratio demonstrates exceptional ability to manage interest expenses, reflecting strong earnings and effective debt management.

### Overall Liquidity Insight:

Apple exhibits strong earnings power and excellent debt management capabilities. However, the liquidity ratios indicate potential short-term financial challenges, and the elevated debt-to-equity ratio suggests a higher reliance on debt financing. Attention to liquidity management and debt levels is recommended to maintain long-term financial stability.

Now, handing off control to the SupervisorAgent for an overall assessment.

Planning to use tools: ['handoff']

Calling Tool: handoff

```
With arguments: {'to_agent': 'SupervisorAgent', 'reason': 'Provide an overall comment based on the comments coming from the ProfitabilityAgent and LiquidityAgent and stored on overall_comments.'}
```

```
Tool Result (handoff):
```

```
Arguments: {'to_agent': 'SupervisorAgent', 'reason': 'Provide an overall comment based on the comments coming from the ProfitabilityAgent and LiquidityAgent and stored on overall_comments.'}
```

```
Output: Agent SupervisorAgent is now handling the request due to the following reason: Provide an overall comment based on the comments coming from the ProfitabilityAgent and LiquidityAgent and stored on overall_comments.. Please continue with the current request.
```

```
=====
Agent: SupervisorAgent
=====
```

```
Planning to use tools: ['get_overall_comments']
```

```
Calling Tool: get_overall_comments
```

```
With arguments: {'overall_comments': {'profitability': {'ROA': '26.13% (Excellent)', 'ROE': '157.41% (Outstanding)', 'Net Profit Margin': '23.97% (Excellent)', 'Gross Margin': '46.21% (Excellent)'}, 'Overall': 'Apple demonstrates exceptional profitability, significantly exceeding healthy thresholds across all metrics.'}, 'liquidity': {'Current Ratio': '0.8673 (Below Healthy Range)', 'Quick Ratio': '0.5589 (Significantly Below Healthy Range)', 'Debt-to-Equity Ratio': '2.0906 (Above Healthy Range)', 'Interest Coverage Ratio': 'Infinity (Excellent)'}, 'Overall': 'Apple has strong earnings and debt management but faces potential short-term liquidity challenges and elevated debt levels.'}}
```

```
Tool Result (get_overall_comments):
```

```
Arguments: {'overall_comments': {'profitability': {'ROA': '26.13% (Excellent)', 'ROE': '157.41% (Outstanding)', 'Net Profit Margin': '23.97% (Excellent)', 'Gross Margin': '46.21% (Excellent)'}, 'Overall': 'Apple demonstrates exceptional profitability, significantly exceeding healthy thresholds across all metrics.'}, 'liquidity': {'Current Ratio': '0.8673 (Below Healthy Range)', 'Quick Ratio': '0.5589 (Significantly Below Healthy Range)', 'Debt-to-Equity Ratio': '2.0906 (Above Healthy Range)', 'Interest Coverage Ratio': 'Infinity (Excellent)'}, 'Overall': 'Apple has strong earnings and debt management but faces potential short-term liquidity challenges and elevated debt levels.'}}
```

```
Output: bad operand type for unary ~: 'CompletionResponse'
```

```
Output: ### Overall Financial Health Assessment for Apple Inc. (AAPL):
```

```
#### Profitability:
```

```
Apple demonstrates exceptional profitability, significantly exceeding healthy thresholds across all key metrics:
```

- \*\*Return on Assets (ROA)\*\*: 26.13% (Excellent)
- \*\*Return on Equity (ROE)\*\*: 157.41% (Outstanding)
- \*\*Net Profit Margin\*\*: 23.97% (Excellent)

- **Gross Margin:** 46.21% (Excellent)

These metrics indicate strong operational efficiency, effective asset and equity management, and robust profitability, positioning Apple favorably for sustained growth.

#### #### Liquidity:

Apple's liquidity analysis presents a mixed picture:

- **Current Ratio:** 0.8673 (Below Healthy Range)
- **Quick Ratio:** 0.5589 (Significantly Below Healthy Range)
- **Debt-to-Equity Ratio:** 2.0906 (Above Healthy Range)
- **Interest Coverage Ratio:** Infinity (Excellent)

While Apple excels in managing interest expenses and demonstrates strong earnings power, the liquidity ratios suggest potential short-term financial challenges. The elevated debt-to-equity ratio indicates a higher reliance on debt financing, which could increase financial risk.

#### ### Overall Conclusion:

Apple Inc. is financially healthy in terms of profitability, showcasing exceptional operational efficiency and profitability metrics. However, the company faces potential liquidity challenges and elevated debt levels, which require careful management to ensure long-term financial stability. Overall, Apple's strong profitability and earnings power provide a solid foundation, but attention to liquidity and debt management is advisable to maintain and enhance financial health.

### Overall Financial Health Assessment for Apple Inc. (AAPL):

**Profitability:** Apple demonstrates exceptional profitability, significantly exceeding healthy thresholds across all key metrics: - **Return on Assets (ROA):** 26.13% (Excellent) - **Return on Equity (ROE):** 157.41% (Outstanding) - **Net Profit Margin:** 23.97% (Excellent) - **Gross Margin:** 46.21% (Excellent)

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#### 5.6.1 Overall Conclusion:

Apple Inc. is financially healthy in terms of profitability, showcasing exceptional operational efficiency and profitability metrics. However, the company faces potential liquidity challenges and

elevated debt levels, which require careful management to ensure long-term financial stability. Overall, Apple's strong profitability and earnings power provide a solid foundation, but attention to liquidity and debt management is advisable to maintain and enhance financial health.

[ ]:

## 5.7 Claude Sonnet

### 5.7.1 Claude 4 Sonnet

#### Agents and Workflow

```
[ ]: # from llama_index.core.agent.workflow import FunctionAgent

fundamental_agent = FunctionAgent(
    name="FundamentalAgent",
    description="Get various fundamental ratios for a given ticker.",
    system_prompt=(
        "You are the fundamental analyst that can extract different fundamental ratios for a given ticker. "
        "Once you have extracted the fundamental financial ratios, you should hand off control to the ProfitabilityAgent to extract the profitability ratios or/and the LiquidityAgent to extract the liquidity ratios."
    ),
    llm=LLM_CLAUDE4,
    tools=[get_fundamentals],
    can_handoff_to=["ProfitabilityAgent"],
)

profitability_agent = FunctionAgent(
    name="ProfitabilityAgent",
    description="Collect profitability ratios for a given ticker: ROA, ROE, Net Profit Margin and Gross Margin and Comment on the results given a set of threshold values.",
    system_prompt=(
        """You are the ProfitabilityAgent that can collect profitability ratios (profitability_ratios) on a given ticker.
        You collect these ratios from the FundamentalAgent.
        Once these ratios are collected in profitability_ratios, you should comment on these ratios based on the thresholds values provided in get_profitability_ratios.
        These comments must be included in threshold_profitability_comments. At the end provide ONLY these comments included in threshold_profitability_comments. DO NOT ADD anything else.
        Once the comments are done, you should hand off control to the LiquidityAgent.
        """
    )
)
```

```

),
llm=LLM_CLAUDE4,
tools=[get_profitability_ratios],
can_handoff_to=["LiquidityAgent"],
)

liquidity_agent = FunctionAgent(
    name="LiquidityAgent",
    description="Collect liquidity ratios for a given ticker: Current Ratio, ▾ Quick Ratio, Debt-to-Equity Ratio, Interest Coverage Ratio and comments on ▾ these ratios given a set of threshold values.",
    system_prompt=(
        """You are the LiquidityAgent that can collect liquidity ratios ▾ (liquidity_ratios) on a given ticker.

        You collect these ratios from the FundamentalAgent.

        Once these ratios are collected in liquidity_ratios, you should comment ▾ on these ratios based on the thresholds values provided in ▾ get_liquidity_ratios.

        These comments must be included in threshold_liquidity_comments. At the ▾ end provide ONLY these comments included in threshold_liquidity_comments. DO ▾ NOT ADD anything else.

        Once the comments are done, you should hand off control to the ▾ SupervisorAgent.

        """
),
llm=LLM_CLAUDE4,
tools=[get_liquidity_ratios],
can_handoff_to=["SupervisorAgent"],
)

supervisor_agent = FunctionAgent(
    name="SupervisorAgent",
    description="Provide an overall comment based on the comments coming from ▾ the ProfitabilityAgent and LiquidityAgent and stored on overall_comments.",
    system_prompt=(
        "You are an fundament analyst expert and supervisor. You collect ▾ comments coming from various agents such as ProfitabilityAgent and ▾ LiquidityAgent.

        "If you collect only one or no comments, go back to ProfitabilityAgent ▾ and LiquidityAgent until you get the desired feedbacks on the ratios.

        "If you don't collect threshold_liquidity_comments, you should hand off ▾ control to the LiquidityAgent to gather these comments.

        "If you don't collect threshold_profitability_comments, you should hand ▾ off control to the ProfitabilityAgent to gather these comments."

```

```

    "Based on the results in the comments coming from the
↳ProfitabilityAgent and LiquidityAgent, provide an overall comment on the
↳health of the firm."
    "Justify your comment with details and data. "
),
llm=LLM_CLAUDE4,
tools=[get_overall_comments],
can_handoff_to=["FundamentalAgent","ProfitabilityAgent","LiquidityAgent"],
)

```

```
[ ]: # from llama_index.core.agent.workflow import AgentWorkflow
```

```

agent_workflow = AgentWorkflow(
    agents=[fundamental_agent, profitability_agent, liquidity_agent, ↳
↳supervisor_agent],
    root_agent=fundamental_agent.name,
    initial_state={
        "ratios": pd.DataFrame(),
        "profitability_ratios": {},
        "liquidity_ratios": {},
        "threshold_profitability_comments": None,
        "threshold_liquidity_comments": None,
        "overall_comments": None,
        "ticker": "",
    },
)

```

## Launch Workflow

```
[ ]: # from llama_index.core.agent.workflow import (
#     AgentInput,
#     AgentOutput,
#     ToolCall,
#     ToolCallResult,
#     AgentStream,
# )

handler = agent_workflow.run(
    user_msg=(
        "Provide the fundamental analysis of Apple and comments on the
↳financial health of the company."
    )
)

current_agent = None
current_tool_calls = ""
```