

Run 2

```
[ ]: 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, 3.16it/s]
Obtaining historical data: 100%|      | 2/2 [00:00<00:00, 9.55it/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']
Calling Tool: handoff
With arguments: {'to_agent': 'ProfitabilityAgent', 'reason': 'Collect
profitability ratios for AAPL and comment on the results given a set of
threshold values.'}
Tool Result (handoff):
Arguments: {'to_agent': 'ProfitabilityAgent', 'reason': 'Collect profitability
ratios for AAPL and comment on the results given a set of threshold values.'}
Output: Agent ProfitabilityAgent is now handling the request due to the
following reason: Collect profitability ratios for AAPL and comment on the
results given a set of threshold values..
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 financial performance and effective use of equity capital, suggesting robust profitability and shareholder value creation.

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 overall financial health.

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 suggests that Apple has a strong ability to manage its production costs relative to sales, maintaining a substantial portion of revenue as gross profit. It indicates effective cost control and competitive advantage in its market.

Overall Insight on Financial Health

Apple Inc. demonstrates exceptional financial health based on its profitability ratios. Each ratio significantly exceeds the healthy thresholds, indicating strong operational efficiency, effective asset and equity utilization, robust profit retention, and excellent cost management. The company's ability to generate high returns on assets and equity, coupled with strong profit margins, highlights its competitive strength and financial stability.

****Strengths**:**

- High efficiency in asset utilization (ROA).
- Exceptional shareholder value creation (ROE).
- Strong profit retention and cost management (Net Profit Margin and Gross Margin).

****Weaknesses**:**

- No apparent weaknesses in profitability ratios.

Overall, Apple's financial health is very strong, with all profitability ratios indicating a well-managed and highly profitable company.

Planning to use tools: ['handoff']

Calling Tool: handoff

With arguments: {'to_agent': 'LiquidityAgent', 'reason': "Profitability ratios for AAPL have been collected and commented on. Now, it's time to collect liquidity ratios and provide comments on them."}

Tool Result (handoff):

Arguments: {'to_agent': 'LiquidityAgent', 'reason': "Profitability ratios for AAPL have been collected and commented on. Now, it's time to collect liquidity ratios and provide comments on them."}

Output: Agent LiquidityAgent is now handling the request due to the following reason: Profitability ratios for AAPL have been collected and commented on. Now, it's time to collect liquidity ratios and provide comments on them..

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
- **Thresholds:**
 - Healthy Range: 1.5 - 3.0
 - Warning Zone: < 1.0
 - Risky/Dangerous: > 3.0 (excess cash)

Score: 3/10

Justification:

The current ratio of 0.8673 indicates that Apple has less than \$1 in current assets for every \$1 of current liabilities, placing it in the warning zone. This suggests potential liquidity issues, as the company may struggle to cover its short-term obligations. However, large tech companies like Apple often operate with lower current ratios due to efficient cash management and strong cash flow generation, which slightly mitigates the concern.

2. Quick Ratio

- **Value:** 0.5589
- **Thresholds:**
 - Healthy Range: > 1.0
 - Warning Zone: < 1.0

Score: 2/10

Justification:

The quick ratio of 0.5589 is below the healthy threshold of 1.0, indicating that Apple may not have enough liquid assets to cover its immediate liabilities without relying on inventory sales. This low quick ratio suggests potential liquidity challenges, but similar to the current ratio, Apple's strong cash flow and market position may offset some risks.

3. Debt-to-Equity Ratio

- **Value:** 2.0906
- **Thresholds:**
 - Healthy Range: 0.3 - 1.5
 - Warning Zone: > 2.0
 - Risky/Dangerous: < 0.3 (under-leveraged)

Score: 4/10

Justification:

The debt-to-equity ratio of 2.0906 is above the healthy range and falls into the

warning zone. This indicates that Apple is using a significant amount of debt relative to its equity, which could increase financial risk. However, Apple's strong earnings and cash flow generation capabilities may allow it to manage this higher leverage effectively.

4. Interest Coverage Ratio

- ****Value:**** Infinity (inf)
- ****Thresholds:****
 - Healthy Range: > 3.0
 - Warning Zone: 1.5 - 3.0
 - Risky/Dangerous: < 1.5 (high risk)

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

****Justification:****

An infinite interest coverage ratio suggests that Apple has no difficulty covering its interest expenses, indicating excellent financial health in terms of its ability to meet debt obligations. This reflects Apple's strong profitability and cash flow, which provide a significant buffer against interest payments.

Overall Insight on Financial Health

****Overall Score:**** 5/10

****Summary:****

Apple's financial health presents a mixed picture. The liquidity ratios (current and quick) are below the healthy thresholds, indicating potential short-term liquidity concerns. However, Apple's strong cash flow and operational efficiency may mitigate these risks. The debt-to-equity ratio is in the warning zone, suggesting higher leverage, but Apple's robust earnings capacity provides some reassurance. The infinite interest coverage ratio is a significant strength, highlighting Apple's ability to comfortably meet its interest obligations.

****Strengths:****

- Exceptional interest coverage ratio, indicating strong profitability and ability to service debt.

****Weaknesses:****

- Low current and quick ratios suggest potential liquidity challenges.
- High debt-to-equity ratio indicates increased financial leverage and associated risks.

Overall, while there are areas of concern, Apple's strong market position and cash flow generation capabilities provide a solid foundation to address these challenges.

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

1. ****Current Ratio**:** The current ratio of 0.8673 places Apple in the warning

zone, suggesting potential liquidity issues as the company may struggle to cover its short-term obligations. However, Apple's efficient cash management and strong cash flow generation slightly mitigate this concern.

2. **Quick Ratio**: With a quick ratio of 0.5589, Apple falls below the healthy threshold, indicating potential liquidity challenges. Despite this, Apple's strong cash flow and market position may offset some risks.

3. **Debt-to-Equity Ratio**: The debt-to-equity ratio of 2.0906 is in the warning zone, indicating significant use of debt relative to equity, which could increase financial risk. However, Apple's strong earnings and cash flow generation capabilities may allow it to manage this higher leverage effectively.

4. **Interest Coverage Ratio**: An infinite interest coverage ratio suggests that Apple has no difficulty covering its interest expenses, indicating excellent financial health in terms of its ability to meet debt obligations.

Overall, while there are areas of concern in liquidity, Apple's strong market position and cash flow generation capabilities provide a solid foundation to address these challenges.

I will now hand off control to the SupervisorAgent for an overall comment based on the profitability and liquidity analysis.

Planning to use tools: ['handoff']

Calling Tool: handoff

With arguments: {'to_agent': 'SupervisorAgent', 'reason': "Liquidity and profitability ratios for AAPL have been collected and commented on. It's time for an overall assessment."}

Tool Result (handoff):

Arguments: {'to_agent': 'SupervisorAgent', 'reason': "Liquidity and profitability ratios for AAPL have been collected and commented on. It's time for an overall assessment."}

Output: Agent SupervisorAgent is now handling the request due to the following reason: Liquidity and profitability ratios for AAPL have been collected and commented on. It's time for an overall assessment..

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. (AAPL) demonstrates exceptional financial health based on its profitability ratios, with all metrics significantly exceeding healthy thresholds. This indicates strong operational efficiency, effective asset and equity utilization, robust profit retention, and excellent cost management. However, liquidity ratios present a mixed picture,

with current and quick ratios below healthy thresholds, suggesting potential short-term liquidity concerns. Despite this, Apple's strong cash flow and operational efficiency may mitigate these risks. The debt-to-equity ratio is in the warning zone, indicating higher leverage, but Apple's robust earnings capacity provides some reassurance. The infinite interest coverage ratio is a significant strength, highlighting Apple's ability to comfortably meet its interest obligations. Overall, while there are areas of concern in liquidity, Apple's strong market position and cash flow generation capabilities provide a solid foundation to address these challenges."}

Tool Result (get_overall_comments):

Arguments: {'overall_comments': "Apple Inc. (AAPL) demonstrates exceptional financial health based on its profitability ratios, with all metrics significantly exceeding healthy thresholds. This indicates strong operational efficiency, effective asset and equity utilization, robust profit retention, and excellent cost management. However, liquidity ratios present a mixed picture, with current and quick ratios below healthy thresholds, suggesting potential short-term liquidity concerns. Despite this, Apple's strong cash flow and operational efficiency may mitigate these risks. The debt-to-equity ratio is in the warning zone, indicating higher leverage, but Apple's robust earnings capacity provides some reassurance. The infinite interest coverage ratio is a significant strength, highlighting Apple's ability to comfortably meet its interest obligations. Overall, while there are areas of concern in liquidity, Apple's strong market position and cash flow generation capabilities provide a solid foundation to address these challenges."}

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

Output: It seems there was an error in processing the overall comments. Let me summarize the analysis based on the collected data:

Overall Financial Health of Apple Inc. (AAPL)

Profitability Analysis:

- Apple exhibits exceptional profitability with all ratios (ROA, ROE, Net Profit Margin, and Gross Margin) significantly exceeding healthy thresholds. This indicates strong operational efficiency, effective asset and equity utilization, robust profit retention, and excellent cost management.

Liquidity Analysis:

- The liquidity ratios present a mixed picture. The current and quick ratios are below healthy thresholds, suggesting potential short-term liquidity concerns. However, Apple's strong cash flow and operational efficiency may mitigate these risks.

- The debt-to-equity ratio is in the warning zone, indicating higher leverage, but Apple's robust earnings capacity provides some reassurance.

- The infinite interest coverage ratio is a significant strength, highlighting Apple's ability to comfortably meet its interest obligations.

Conclusion:

Overall, Apple Inc. demonstrates strong financial health, particularly in terms

of profitability. While there are areas of concern in liquidity, Apple's strong market position and cash flow generation capabilities provide a solid foundation to address these challenges. The company remains well-positioned to manage its financial obligations and continue its growth trajectory.

Run 3

```
[ ]: 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 [00:01<00:00, 2.26it/s]
```

```
Obtaining historical data: 100%|      | 2/2 [00:00<00:00, 9.51it/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']
```

```
Calling Tool: handoff
```

```
With arguments: {'to_agent': 'ProfitabilityAgent', 'reason': 'Collect  
profitability ratios for AAPL and comment on the results given a set of  
threshold values.'}
```

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

```
Arguments: {'to_agent': 'ProfitabilityAgent', 'reason': 'Collect profitability  
ratios for AAPL and comment on the results given a set of threshold values.'}
```

```
Output: Agent ProfitabilityAgent is now handling the request due to the  
following reason: Collect profitability ratios for AAPL and comment on the  
results given a set of threshold values..
```

```
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, 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 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 performance 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 financial performance and effective use of equity capital. Such a high ROE is often indicative of a competitive advantage and robust profitability.

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 suggests that the company is very effective at converting revenue into actual profit, indicating 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: The gross margin of 46.21% is above the healthy threshold of 40%, indicating that Apple retains a significant portion of revenue after accounting for the cost of goods sold. This suggests strong pricing strategies and cost control, contributing to the company's overall profitability and financial stability.

Overall Insight on Financial Health

Summary: Based on the analysis of Apple's profitability ratios, the company demonstrates exceptional financial health. All evaluated ratios are well above the healthy thresholds, indicating strong operational efficiency, effective asset and equity utilization, and robust profit generation. Apple's high scores across all profitability metrics reflect its competitive advantage, strong market position, and effective management strategies. The company's strengths lie in its ability to generate high returns on assets and equity, maintain substantial profit margins, and efficiently manage costs. There are no apparent weaknesses in the profitability aspect of Apple's financial health, suggesting a very positive outlook for the firm.

Planning to use tools: ['handoff']

Calling Tool: handoff

With arguments: {'to_agent': 'LiquidityAgent', 'reason': 'Collect liquidity ratios for AAPL and comment on the results given a set of threshold values.'}

Tool Result (handoff):

Arguments: {'to_agent': 'LiquidityAgent', 'reason': 'Collect liquidity ratios for AAPL and comment on the results given a set of threshold values.'}

Output: Agent LiquidityAgent is now handling the request due to the following reason: Collect liquidity ratios for AAPL and comment on the results given a set of 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
- **Evaluation:** 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 places the company in the warning zone, suggesting potential liquidity issues.
- **Score:** 3
- **Justification:** The score of 3 reflects the fact that the current ratio is significantly below the healthy range, indicating potential liquidity concerns. 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
- **Evaluation:** The quick ratio is also below the healthy threshold, indicating that Apple may struggle to meet its short-term obligations without relying on inventory sales.
- **Score:** 2
- **Justification:** The score of 2 is assigned because the quick ratio is well below the healthy threshold, suggesting a potential inability to quickly cover short-term liabilities with liquid assets.

3. Debt-to-Equity Ratio

- **Value:** 2.0906
- **Healthy Range:** 0.3 - 1.5
- **Evaluation:** The debt-to-equity ratio is above the healthy range and falls into the warning zone. This suggests that Apple is using a higher level of debt financing relative to equity, which could increase financial risk.
- **Score:** 4
- **Justification:** A score of 4 is given because the ratio is above the healthy range, indicating higher leverage. However, it is not in the risky/dangerous zone, which would indicate under-leverage.

4. Interest Coverage Ratio

- **Value:** Infinity (inf)
- **Healthy Range:** > 3.0
- **Evaluation:** An infinite interest coverage ratio suggests that Apple has no difficulty covering its interest expenses, indicating strong financial health in

terms of interest obligations.

- **Score:** 10

- **Justification:** The score of 10 reflects the extremely strong ability to cover interest expenses, as indicated by the infinite ratio. This suggests no immediate risk related to interest payments.

Overall Insight on Financial Health

Apple's financial health presents a mixed picture based on the provided ratios:

- **Strengths:** The infinite interest coverage ratio is a significant strength, indicating that Apple has no issues meeting its interest obligations, which is a critical aspect of financial stability.

- **Weaknesses:** The current and quick ratios are both below the healthy thresholds, suggesting potential liquidity concerns. Additionally, the debt-to-equity ratio is in the warning zone, indicating higher leverage than the healthy range.

In summary, while Apple demonstrates strong capability in managing its interest expenses, the liquidity ratios suggest potential short-term financial challenges. The company may need to focus on improving its liquidity position to ensure it can meet its short-term obligations without relying heavily on debt.

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

1. **Current Ratio:** The current ratio of 0.8673 is below the healthy range of 1.5 - 3.0, indicating potential liquidity issues. Apple may not have enough current assets to cover its current liabilities, placing it in the warning zone. **Score: 3**

2. **Quick Ratio:** The quick ratio of 0.5589 is below the healthy threshold of > 1.0, suggesting potential difficulties in meeting short-term obligations without relying on inventory sales. **Score: 2**

3. **Debt-to-Equity Ratio:** With a value of 2.0906, the debt-to-equity ratio is above the healthy range of 0.3 - 1.5, indicating higher leverage and increased financial risk. **Score: 4**

4. **Interest Coverage Ratio:** An infinite interest coverage ratio suggests no difficulty in covering interest expenses, indicating strong financial health in terms of interest obligations. **Score: 10**

Overall Insight: While Apple shows strong capability in managing interest expenses, the liquidity ratios suggest potential short-term financial challenges. The company may need to improve its liquidity position to ensure it can meet short-term obligations without heavily relying on debt.

Now, I will hand off control to the SupervisorAgent for an overall comment based on the profitability and liquidity analysis.

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.'}
Tool Result (handoff):
Arguments: {'to_agent': 'SupervisorAgent', 'reason': 'Provide an overall comment based on the comments coming from the ProfitabilityAgent and LiquidityAgent.'}
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..
Please continue with the current request.

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

Planning to use tools: ['get_overall_comments']
Calling Tool: get_overall_comments
With arguments: {'overall_comments': "Based on the analysis of Apple's profitability and liquidity ratios, the company demonstrates exceptional financial health in terms of profitability but faces some challenges in liquidity. \n\n### Profitability Analysis:\nApple's profitability ratios are outstanding, with ROA, ROE, Net Profit Margin, and Gross Margin all significantly exceeding healthy thresholds. This indicates strong operational efficiency, effective asset and equity utilization, and robust profit generation. Apple's high scores across all profitability metrics reflect its competitive advantage, strong market position, and effective management strategies.\n\n### Liquidity Analysis:\nHowever, the liquidity analysis presents a mixed picture. While the interest coverage ratio is extremely strong, indicating no issues with meeting interest obligations, the current and quick ratios are below healthy thresholds, suggesting potential liquidity concerns. The debt-to-equity ratio is also in the warning zone, indicating higher leverage than the healthy range.\n\n### Overall Health:\nIn summary, Apple is in excellent financial health from a profitability standpoint, showcasing its ability to generate substantial returns and maintain high profit margins. However, the company should address its liquidity position to ensure it can meet short-term obligations without relying heavily on debt. Improving liquidity ratios would enhance Apple's overall financial stability and reduce potential risks associated with short-term financial challenges."}

Tool Result (get_overall_comments):
Arguments: {'overall_comments': "Based on the analysis of Apple's profitability and liquidity ratios, the company demonstrates exceptional financial health in terms of profitability but faces some challenges in liquidity. \n\n### Profitability Analysis:\nApple's profitability ratios are outstanding, with ROA, ROE, Net Profit Margin, and Gross Margin all significantly exceeding healthy thresholds. This indicates strong operational efficiency, effective asset and equity utilization, and robust profit

generation. Apple's high scores across all profitability metrics reflect its competitive advantage, strong market position, and effective management strategies.\n\n#### Liquidity Analysis:\n\nHowever, the liquidity analysis presents a mixed picture. While the interest coverage ratio is extremely strong, indicating no issues with meeting interest obligations, the current and quick ratios are below healthy thresholds, suggesting potential liquidity concerns. The debt-to-equity ratio is also in the warning zone, indicating higher leverage than the healthy range.\n\n#### Overall Health:\n\nIn summary, Apple is in excellent financial health from a profitability standpoint, showcasing its ability to generate substantial returns and maintain high profit margins. However, the company should address its liquidity position to ensure it can meet short-term obligations without relying heavily on debt. Improving liquidity ratios would enhance Apple's overall financial stability and reduce potential risks associated with short-term financial challenges."}

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

Output: Based on the analysis of Apple's profitability and liquidity ratios, the company demonstrates exceptional financial health in terms of profitability but faces some challenges in liquidity.

Profitability Analysis:

Apple's profitability ratios are outstanding, with ROA, ROE, Net Profit Margin, and Gross Margin all significantly exceeding healthy thresholds. This indicates strong operational efficiency, effective asset and equity utilization, and robust profit generation. Apple's high scores across all profitability metrics reflect its competitive advantage, strong market position, and effective management strategies.

Liquidity Analysis:

However, the liquidity analysis presents a mixed picture. While the interest coverage ratio is extremely strong, indicating no issues with meeting interest obligations, the current and quick ratios are below healthy thresholds, suggesting potential liquidity concerns. The debt-to-equity ratio is also in the warning zone, indicating higher leverage than the healthy range.

Overall Health:

In summary, Apple is in excellent financial health from a profitability standpoint, showcasing its ability to generate substantial returns and maintain high profit margins. However, the company should address its liquidity position to ensure it can meet short-term obligations without relying heavily on debt. Improving liquidity ratios would enhance Apple's overall financial stability and reduce potential risks associated with short-term financial challenges.

5.4.2 GPT-4o Answer:

Overall Financial Health of Apple Inc. (AAPL) Profitability Analysis: - Apple exhibits exceptional profitability with all ratios (ROA, ROE, Net Profit Margin, and Gross Margin) significantly exceeding healthy thresholds. This indicates strong operational efficiency, effective asset and equity utilization, robust profit retention, and excellent cost management.

Liquidity Analysis: - The liquidity ratios present a mixed picture. The current and quick ratios are below healthy thresholds, suggesting potential short-term liquidity concerns. However, Apple's strong cash flow and operational efficiency may mitigate these risks. - The debt-to-equity ratio is in the warning zone, indicating higher leverage, but Apple's robust earnings capacity provides some reassurance. - The infinite interest coverage ratio is a significant strength, highlighting Apple's ability to comfortably meet its interest obligations.

Conclusion: Overall, Apple Inc. demonstrates strong financial health, particularly in terms of profitability. While there are areas of concern in liquidity, Apple's strong market position and cash flow generation capabilities provide a solid foundation to address these challenges. The company remains well-positioned to manage its financial obligations and continue its growth trajectory.

5.5 LLM: GPT-4.1

5.5.1 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 fundament 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_41,
    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_41,
    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_41,
    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 fundement 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_41,
    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": "",
    },
)

```

5.5.2 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, 3.68it/s]
Obtaining historical data: 100%|      | 2/2 [00:00<00:00, 9.56it/s]

ratios 2022      NaN
2023      0.275
2024      0.2613
Freq: Y-DEC, Name: Return on Assets, dtype: float64
    Calling Tool: get_fundamentals

```