

## **Learning Module 11: Financial Analysis Techniques**

### **LOS 11a: describe tools and techniques used in financial analysis, including their uses and limitations**

Financial analysis helps assess a company's financial performance over time and identify the trends in that performance. It can also be used to evaluate a company's equity securities, assess its financial risk exposures, and perform necessary due diligence before a prospective merger or acquisition.

Given the diverse purposes for performing financial analysis, the wide range of techniques available, and the often substantial amount of data involved, it is crucial that the analytical approach be tailored to the specific situation.

Recall the steps in the financial analysis framework covered in learning module 1:

**Step 1:** Articulate the Purpose and Context of the Analysis

**Step 2:** Collect Data

**Step 3:** Process Data

**Step 4:** Analyze and Interpret the Data

**Step 5:** Develop and communicate conclusions and recommendations

**Step 6:** Follow-up

Based on financial analysis framework, before starting any financial analysis, the analyst should clearly define the purpose and context by addressing the following points:

1. **Purpose of the Analysis:** What specific questions is the analysis intended to answer?
2. **Level of Detail Required:** What depth of detail is necessary to achieve the analysis's objectives?
3. **Available Data:** What data is accessible for use in the analysis?
4. **Influential Factors and Relationships:** What are the key factors or relationships that will impact the analysis?

## 5. **Analytical Limitations:** What constraints exist, and how might they affect the analysis?

Once the purpose and context are clarified, the analyst can choose the appropriate techniques (e.g., ratios) to best aid decision-making. Clearly, this falls under steps 3 and 4 of the financial statement analysis framework.

# Tools and Techniques Used in Financial Analysis

Several tools and techniques may be used when evaluating a company's financial status. These tools and techniques help analysts evaluate company data through comparisons. It is challenging to determine if a company's financial performance is "good" or "bad" without a clear basis for comparison.

To assess a company's ability to generate and grow earnings and cash flow, and to understand the risks associated with those earnings and cash flows, analysts use:

- **Cross-Sectional Analysis:** Comparing the company to other companies at the same point in time or over the same period.
- **Trend or Time-Series Analysis:** Comparing the company's performance over different periods to identify trends.

# Ratio Analysis

Ratios express one quantity in relation to another, typically as a quotient. There are numerous relationships among financial accounts and expected relationships over different time periods. Ratios are an effective method for illustrating these relationships.

## Aspects of Ratio Analysis

Several key aspects of ratio analysis are crucial to understand:

1. **Ratios are indicators, not the answers:** A computed ratio serves as an indicator of a

company's performance. It provides insights into what happened but not necessarily why it happened. For instance, to determine which of the two companies was more profitable, an analyst might use the net profit margin, which expresses profit relative to revenue. This is calculated by dividing net income by revenue:

$$\text{Net Profit Margin} = \frac{\text{Net Income}}{\text{Revenue}}$$

**2. Accounting Policy Differences:** Differences in accounting policies across companies and over time can distort ratios. Meaningful comparisons may require adjustments to the financial data to account for these differences.

**3. Relevance of Ratios:** Not all ratios are pertinent to every analysis. An essential analytical skill is selecting the relevant ratio(s) to answer a specific research question.

**4. Interpretation is Key:** Ratio analysis involves more than just computation; interpretation is crucial. Differences in ratios across time and companies can be subtle, and interpreting these differences requires a deep understanding of the specific situation.

## Number of Ratios is Limitless

No authoritative bodies prescribe the exact formulas for computing ratios or provide a standardized, comprehensive list of ratios. Formulas and even names of ratios can vary among analysts or databases. The potential number of different ratios is practically limitless.

However, several widely accepted ratios have proven useful. Analysts should be aware that different ratios may be used in practice, and certain industries have unique ratios tailored to their characteristics.

When faced with an unfamiliar ratio, the analyst should examine the underlying formula to understand what the ratio measures.

For example, consider the return on assets (ROA) formula:

$$\text{ROA} = \frac{\text{Operating Income}}{\text{Average Total Assets}}$$

Assume that you are unfamiliar with this ratio and that you want to check whether an ROA of 20% is better than 10%.

Examining the formula, notice that the ratio measures the amount of operating income generated per unit of assets. Thus, generating EUR 20 of operating income per EUR100 of average total assets is better than generating EUR 10. Intuitively, this ratio indicates profitability and efficiency in using assets to generate operating profits.

Needless to say, when encountering a ratio for the first time, analysts should evaluate the numerator and denominator to assess what the ratio measures and how it should be interpreted.

A good rule of thumb is that when an income statement or cash flow statement number is in the numerator and a balance sheet number is in the denominator, an average should be used for the denominator.

It is usually unnecessary to use averages when only balance sheet numbers are used in both the numerator and denominator since both are determined as of the same date. However, some instances may still require averages, such as in the decomposition of return on equity (ROE), which is defined as net income divided by average shareholders' equity. If an average is used in one component ratio, it should be used in the other.

However, if an average is used, judgment is required about which average to use. Most ratio databases use a simple average of the beginning and end-of-year balance sheet amounts for simplicity. If the company's business is seasonal, resulting in asset levels varying by interim period (semiannual or quarterly), using average overall interim periods, if available, may be beneficial. If the analyst has access to monthly data, this can also create a more accurate average.

## **Advantages and Limitations of Ratio Analysis**

Financial ratios offer insights into:

- Economic connections within a company that assist analysts in forecasting earnings and free cash flow;

- A company's financial adaptability, or its capacity to secure the necessary funds for growth and to meet obligations, even under unforeseen conditions;
- The competency of management;
- Developments within the company or industry over time; and
- Comparability with similar companies or the industry as a whole.

Limitations to ratio analysis include:

- **Diversity or uniformity of a company's operations:** Companies with divisions across various industries may find it challenging to locate comparable industry ratios for analysis purposes.
- **Necessity to verify the consistency of ratio analysis results:** Different sets of ratios might reveal conflicting information, with one indicating a problem while another suggests the issue is only temporary.
- **Requirement for professional judgment:** It is essential to determine if a company's ratio falls within an acceptable range. Financial ratios help evaluate growth potential and risk, but they cannot independently determine a company's value, creditworthiness, or overall health. A comprehensive assessment of the company and its external economic and industry environment is vital.
- **Impact of different accounting methods:** Companies often have flexibility in selecting accounting practices, which can lead to incomparable ratios unless adjustments are made. Key accounting considerations include:
  - FIFO, LIFO, or average cost inventory valuation methods. Recall that, IFRS does not permit LIFO.
  - Cost or equity methods for accounting for unconsolidated affiliates;
  - Straight-line versus accelerated depreciation methods and
  - The treatment of leases as operating or finance leases (under US GAAP, lease classification affects expense categorization, whereas IFRS does not allow

operating lease treatment for lessors).

## Sources of Ratios

Ratios can be computed using financial statements of companies or from databases such as Bloomberg, Compustat, FactSet, or Thomson Reuters. These databases not only provide data reported in financial statements but also offer calculated ratios. They are favored for their extensive historical data, allowing for trend analysis over multiple years. Additionally, they enable ratio calculations for periods other than the company's fiscal year, such as trailing 12 months (TTM) or the most recent quarter (MRQ).

Analysts need to be aware that different vendors may use distinct formulas to calculate ratios. Analysts should obtain the specific formulas from the vendor and assess whether any adjustments are needed. Database providers often apply judgment when classifying items, which can affect computations. For instance, operating income might not be directly listed on a company's income statement, so the provider may classify items as operating or non-operating. These judgments can influence the accuracy of ratio computations.

Therefore, it's best practice to use the same data source when comparing different companies or evaluating the historical performance of a single company. Analysts should verify the consistency of formulas and data classifications from the data source.

The process of collecting financial data from regulatory filings and calculating ratios can be automated using the eXtensible Business Reporting Language (XBRL). XBRL uses "smart tags" attached to financial information (such as total assets), allowing software to automatically gather data and perform necessary calculations. The development of XBRL is overseen by an international nonprofit consortium, including the International Accounting Standards Board (IASB). Many stock exchanges and regulatory agencies worldwide now use XBRL to receive and distribute public financial reports from listed companies.

Analysts can compare a company to its peers using vendor databases or aggregate industry data. For non-public companies, industry data can be sourced from publications like the Annual Statement Studies by the Risk Management Association or Dun & Bradstreet. These publications often categorize companies into quartiles based on their ratios, helping analysts determine a

company's relative position within the industry.

## Common-size Analysis

Common-size analysis entails expressing financial data, including entire financial statements, relative to a single financial statement item or base. The most commonly used bases are total assets or revenue. Essentially, common-size analysis establishes a ratio between each financial statement item and the base item.

This method was illustrated in earlier modules for the income statement, balance sheet, and cash flow statement. In this section, we delve into the common-size analysis of financial statements in greater detail and provide further discussion on their interpretation.

### Common-Size Analysis of the Balance Sheet

A vertical common-size balance sheet is created by dividing each item on the balance sheet by the total assets of the same period and expressing the results as percentages. This method highlights the composition of the balance sheet, revealing the mix of assets being used and the sources of financing. It also allows for comparisons between a company's balance sheet composition and that of its peers, providing insights into the reasons for any differences.

A horizontal common-size balance sheet, on the other hand, is prepared by calculating the percentage increase or decrease of each balance sheet item from the previous year or by dividing the quantity of each item by the base year quantity. This approach emphasizes changes in items over time, which can then be compared to expectations.

#### Example: Common-size analysis of a balance sheet

Consider the following partial balance sheet of a hypothetical company, Prudential World Assets (in millions).

Year	20X4	20X5	20X6	20X7	20X8	20X9
Cash	\$60	\$63	\$55	\$57.5	\$60	\$62.5
Inventory	\$230	\$241.5	\$253	\$264.5	\$264	\$275
Accounts Receivable	\$160	\$168	\$176	\$172.5	\$180	\$187.5
Net Plant and Equipment	\$500	\$525	\$561	\$586.5	\$624	\$650
Intangibles	\$60	\$63	\$55	\$57.5	\$60	\$62.5
Total Assets	\$1,000	\$1,050	\$1,100	\$1,150	\$1,200	\$1,250

Create both vertical and provide the interpretation of the trend in accounts receivables; also, create a horizontal common-size balance sheet.

### Solution

The vertical common-size balance sheet is given below:

Year	20X4	20X5	20X6	20X7	20X8	20X9
Cash	6%	6%	5%	5%	5%	5%
Inventory	23%	23%	23%	23%	22%	22%
Accounts Receivable	16%	16%	16%	15%	15%	15%
Net Plant and Equipment	50%	50%	51%	51%	52%	52%
Intangibles	6%	6%	5%	5%	5%	5%
Total assets	100%	100%	100%	100%	100%	100%

Accounts receivables remained stable at 16% of total assets during the first three years. This indicates that the proportion of assets tied up in receivables was consistent, suggesting stable credit policies and collection practices during this period.

However, there is a slight decrease to 15% in the last three years. This 1% decline suggests a few possible scenarios:

- **Improved Collection Efficiency:** The company might have improved its collection processes, resulting in a lower proportion of receivables.
- **Change in Sales or Credit Policies:** The company could have tightened its credit policies, extending less credit to customers, or shifted sales strategies to more cash sales.

Lastly, the horizontal common-size balance sheet is given below:

Year	20X4	20X5	20X6	20X7	20X8	20X9
Cash	100.00%	101.00%	102.01%	103.03%	104.06%	105.10%
Inventory	100.00%	103.00%	106.09%	109.27%	112.55%	115.93%
Accounts Receivable	100.00%	102.00%	104.04%	106.12%	108.24%	110.41%
Net Plant and Equipment	100.00%	104.00%	108.16%	112.49%	116.99%	121.67%
Intangibles	100.00%	100.50%	101.00%	101.51%	102.02%	102.53%
Total assets	100.00%	103.08%	106.27%	109.57%	112.99%	116.53%

The horizontal-common size balance above shows consistent annual growth in accounts receivables. This steady increase can be a positive signal of growing sales and business expansion, indicating that the company is selling more on credit terms.

Note that account receivables growth needs to be managed effectively to ensure that it translates into actual cash inflows and does not lead to significant increases in uncollectible receivables. The company should focus on maintaining a balance between extending credit to boost sales and ensuring timely collections to support cash flow.

## Common-Size Analysis of the Income Statement

A vertical common-size income statement involves dividing each income statement item by revenue or, in some cases, by total assets (particularly for financial institutions). For companies with multiple revenue sources, breaking down the revenue into percentage terms can be particularly useful.

### Example: Interpretation of Common-Size Income Statement

Consider the following common-size income statement of a hypothetical company (in millions):

	Period 1	Percent of Total Revenue	Period 2	Percent of Total Revenue
Revenue source A	1,020	34%	1,200	40%
Revenue source B	880	29%	600	20%
Revenue source C	1,100	37%	1,200	40%
Total revenue	3,000	100%	3,000	100%
Salaries and employee benefits	600	20%	660	22%
Administrative expenses	750	25%	690	23%
Rent expense	360	12%	330	11%
EBITDA	1,290	43%	1,320	44%
Depreciation and amortization	150	5%	120	4%
EBIT	1,140	38%	1,200	40%
Interest paid	180	6%	150	5%
EBT	960	32%	1,050	35%
Income tax provision	300	10%	270	9%
Net income	660	22%	780	26%

Based on the above common-size income statement, provide interpretation on revenue dynamics, profitability analysis, efficiency in administrative and rent Expenses and effective tax rate and income tax analysis.

## Solution

### ***Revenue Dynamics:***

Revenues from Service A and Service C have become a significantly greater percentage of the company's total revenue (from 34% and 37% in Period 1 to 40% each in Period 2). Conversely, revenue from Service B has decreased from 29% to 20%. These changes may imply that the company may have strategically shifted its focus towards Services A and C due to their higher market demand or competitive advantage. This shift, however, should be examined in light of the overall profitability.

### ***Profitability Analysis:***

The company's EBITDA has slightly increased from 43% to 44% of total revenue. This slight improvement in profitability might suggest that Services A and C have better margins compared to Service B.

The increase in operating expenses, particularly salaries and employee benefits (from 20% to 22%), indicates that Services A and C might require more specialized or higher-paid employees. This could explain the slight increase in overall profitability despite higher costs.

### ***Efficiency in Administrative and Rent Expenses:***

Administrative expenses have decreased from 25% to 23%, and rent expenses from 12% to 11%, which could indicate improved efficiency or cost management in these areas, partially offsetting the increased salary expenses.

### ***Effective tax rate and income tax analysis:***

The company's income tax as a percentage of sales has decreased from 10% to 9%. The effective tax rate (taxes as a percentage of EBT) has also decreased from approximately 31% ( $= 10/32$ ) to about 26% ( $= 9/35$ ).

The lower effective tax rate might be due to a larger portion of revenues from Services A and C being generated in jurisdictions with lower tax rates. This could be a strategic move to optimize the tax burden. Moreover, there might be specific tax incentives or credits associated with Services A and C, such as R&D credits, investment incentives, or other tax benefits that reduce the overall tax liability.

## **Uses and Limitations of Common-Size Analysis**

### **Uses**

- Provides a detailed understanding of how a company utilizes its assets.
- Identifies the various methods a company employs to finance its operations and growth.

- Facilitates comparison between companies, helping to identify and analyze differences in their financial strategies and performance.

## **Limitations**

- Financial statements reported in different currencies need to be converted to a common currency for accurate comparison.
- Variations in fiscal year-end dates can complicate comparability between companies.
- Differences in accounting standards and practices can hinder direct comparison of financial statements.

## **Cross-sectional, Trend Analysis and Linkages in Financial Statements**

### **Cross-sectional Analysis**

The usefulness of ratios and common-size statements comes from their ability to facilitate comparisons. As such, cross-sectional analysis, also known as "relative analysis," involves comparing a specific metric of one company with the same metric of another company or group of companies at the same point in time or over the same period. This allows for meaningful comparisons even if the companies are of different sizes or operate in different currencies.

#### **Example: Cross-sectional Analysis**

Consider the following partial vertical common-size balance sheets for two companies, A and B.

Assets	Company A (millions)	Percent of Total Assets	Company B (millions)	Percent of Total Assets
Cash	\$60	6%	\$63	12%
Receivables	\$160	16%	\$168	33%
Inventory	\$230	23%	\$241.5	27%
Fixed assets net of depreciation	\$500	50%	\$525	55%
Investments	\$50	5%	\$52.5	7%
Total Assets	\$1,000	100%	\$1,050	100%

Compare the liquidity of the two companies.

### Solution

Company A demonstrates significantly higher liquidity compared to Company B. Liquidity is determined by how easily assets can be converted to cash. Company A has 6 percent of its assets in cash, whereas Company B holds only 12 percent in cash. Given that cash is generally a low-yield asset and not an efficient use of excess funds, it raises the question of why Company A maintains such a high cash balance. This large cash reserve could indicate that Company A is gearing up for a potential acquisition or it might be holding cash as a buffer against a volatile operating environment.

Additionally, the comparison reveals that a substantial portion of Company B's assets is tied up in receivables (33 percent). This could suggest several possibilities: a higher level of credit sales, changes in asset composition, potentially lower credit or collection standards, or even aggressive accounting practices. This higher percentage of receivables may pose risks if these receivables are not collected promptly.

### Trend Analysis

When examining financial statements and ratios, it's crucial to consider trends in the data, whether they are improving or deteriorating, along with the current absolute or relative levels. Trend analysis offers valuable insights into historical performance and growth. With a sufficiently long history of accurate seasonal data, trend analysis can be a powerful tool for planning and forecasting for both management and analysts.

Analyzing horizontal common-size balance sheets reveals structural changes within a business over time. While past trends do not always predict future performance, especially in changing economic or competitive environments, they are more valuable when these environments are stable, or the business is mature. In less stable contexts, historical analysis can still help develop expectations by providing a foundation for understanding past trends which is crucial in assessing whether these trends will continue or shift direction.

### **Example: Trend Analysis**

Consider the following partial horizontal balance sheet of the hypothetical company Prudential World Assets.

Year	20X4	20X5	20X6	20X7	20X8	20X9
Cash	100.00%	101.00%	102.01%	103.03%	104.06%	105.10%
Inventory	100.00%	103.00%	106.09%	109.27%	112.55%	115.93%
Accounts Receivable	100.00%	102.00%	104.04%	106.12%	108.24%	110.41%
Net Plant and Equipment						
Intangibles	100.00%	100.50%	101.00%	101.51%	102.02%	102.53%
Total assets	100.00%	103.08%	106.27%	109.57%	112.99%	116.53%

Analyze the trends in inventory levels and net plant and equipment.

### **Solution**

From 20X4 to 20X9, the inventory has increased by 15.93%. This cumulative growth reflects the company's strategy to maintain higher inventory levels, which could be due to several reasons such as anticipating higher demand, reducing stockouts, or taking advantage of bulk purchasing discounts.

The net plant and equipment have shown a steady growth rate of 4% per year over the six-year period. This consistent increase indicates a continuous investment in the company's fixed assets. From 20X4 to 20X9, the net plant and equipment have increased by 21.67%.

The steady investment in net plant and equipment suggests that the company may be pursuing a strategy of expansion, modernization, or increased production capacity.

## **Relationship Among Financial Statements**

Trend data generated by horizontal common-size analysis can be compared across financial statements to provide insights into a company's performance. For example, if revenue is growing faster than assets, the company may be increasing efficiency, generating more revenue per dollar invested in assets.

Moreover, if net income grows faster than revenue, it indicates increasing profitability. However, the analyst must determine whether this net income growth stems from ongoing operations or non-recurring items.

Additionally, a decline in operating cash flow despite rising revenue and net income warrants further investigation as it may signal issues with earnings quality, potentially due to aggressive revenue reporting. Conversely, if assets grow faster than revenue, it may suggest declining efficiency, necessitating an examination of the asset composition and the reasons for these changes.

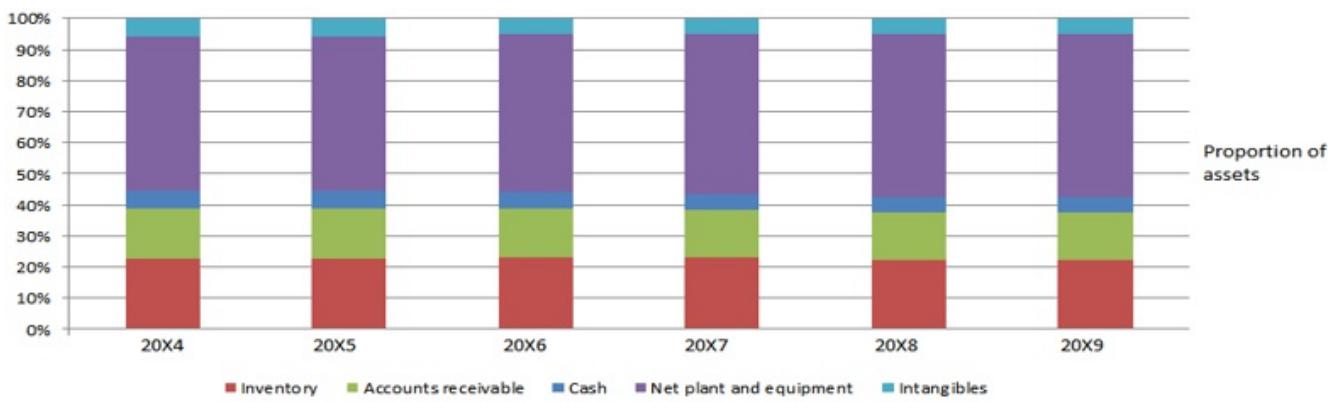
## **Graphs**

Graphs are an effective tool for comparing performance and financial structure over time, highlighting key changes in business operations. They offer analysts and management a visual summary of risk trends within the company. Additionally, graphs can effectively convey an analyst's conclusions about financial health and risk management.

Selecting the right type of graph to present the key findings of a financial analysis requires skill. Generally, pie charts are ideal for showing the composition of a total value, such as assets, over a short period (one or two periods). Line graphs are suitable for illustrating changes in amounts for a few items over a longer period. When both composition and amounts, along with their changes over time, are important, a stacked column graph can be particularly useful.

### **Example: Graph Analysis**

Consider the following stacked column graph of the vertical common-size (partial) balance sheet of the hypothetical company Prudential World Assets:



Analyze the asset composition of the company.

### Solution

Overall, the graph shows that the asset composition of Prudential World Assets has been quite stable over the years, with slight increases in inventory and intangibles and a noticeable decrease in cash. The consistency in net plant and equipment and accounts receivable suggests stable operational management. The decreasing cash reserves warrant further investigation to understand the company's cash utilization strategy.

## Regression Analysis

When examining the trend in a specific line item or ratio, visually assessing the changes is often possible. However, for more intricate scenarios, regression analysis can be employed to identify relationships or correlations between variables.

For instance, regression analysis might link a company's sales to GDP over time, offering insights into the company's cyclical nature. Furthermore, the statistical relationship between sales and GDP can serve as a foundation for sales forecasts. Regression analysis can also be useful in other contexts, such as examining the relationship between a company's sales and inventory over time or between hotel occupancy and a company's hotel revenues.

Beyond forecasting, regression analysis helps in identifying items or ratios that deviate from expected patterns based on historical statistical relationships.

## Distinguishing between Computations and Analysis

Effective analysis integrates both computations and interpretations. Unlike a simple aggregation of data, computations, tables, and graphs, a well-reasoned analysis synthesizes the collected data into a unified understanding. When analyzing past performance, the analysis should not only address what happened but also why it happened and whether it created value. Key questions to consider include:

- **Critical Performance Aspects:** What performance factors are crucial for the company to compete successfully in its industry?
- **Performance Evaluation:** How well did the company meet these critical performance aspects? (This is determined through computations and comparisons with relevant benchmarks, such as the company's historical performance or that of its competitors.)
- **Performance Causes and Strategy Reflection:** What were the main causes of this performance, and how does it align with the company's strategy? (This is established through detailed analysis.)

For forward-looking analysis, additional questions include:

- **Impact of Events or Trends:** What is the likely impact of a specific event or trend? (This is determined through interpretation of the analysis.)
- **Management Response:** How is management likely to respond to this trend? (This is assessed by evaluating the quality of management and corporate governance.)
- **Impact on Future Cash Flows:** How will trends in the company, industry, and economy affect future cash flows? (This is assessed through analysis of corporate strategy and forecasts.)
- **Analyst Recommendations:** What recommendations does the analyst provide? (These are based on the interpretation and forecasting of the analysis results.)
- **Highlighting Risks:** What risks need to be highlighted? (This is established by

evaluating major uncertainties in the forecast and the environment in which the company operates.)

## Communicating Analytical Findings in Written Reports

Analysts often need to communicate their findings in a written report. This report should clearly explain how conclusions were reached and the reasons behind specific recommendations. Key elements of an effective report include:

- **Purpose of the Report:** State the purpose of the report unless it is already obvious.
- **Business Context:** This includes:
  - **Economic Environment:** Describe the country or region, macroeconomic factors, and the sector in which the company operates.
  - **Financial Infrastructure:** Discuss the role of accounting, auditing, and rating agencies.
  - **Legal and Regulatory Environment:** Highlight significant constraints affecting the company.
- **Corporate Governance and Management Strategy:** This involves:
  - Evaluating the company's governance practices.
  - Assessing the management's strategy and competitive advantages.
- **Financial and Operational Data:**
  - Analyze key financial and operational data.
  - Identify and explain the key assumptions used in the analysis.
- **Conclusions and Recommendations:**
  - Provide well-supported conclusions.
  - Make recommendations while acknowledging the analysis's limitations and potential risks.

Using 3-10 years of data and appropriate analytic techniques enhances the narrative. The report should be continuous and cohesive, integrating all these elements to present a clear and comprehensive picture of the findings and their implications.

## Question 1

Which of the following is *least likely* a typical approach to comparing financial data reported in different currencies?

- A. Comparing financial data using ratios.
- B. Using trailing twelve months of data for each company being compared.
- C. Translating all reported currencies into one common currency using the prevailing foreign exchange rates at the relevant period's end.

### Solution

The correct answer is **B**.

Using trailing twelve months of data is useful when differences exist in the fiscal year ends of the companies being compared. It is not used for comparing companies whose differences lie in the reporting currency used to prepare their financial statements.

Options A and C describe typical approaches to overcome differences in reported currencies.

## Question 2

To compare the performance of two companies with different end-of-period dates, an analyst would *most likely* use:

- A. Ratio analysis.
- B. Regression analysis.
- C. Trailing twelve months analysis.

### Solution

The correct answer is **C**.

It is better to start the comparison by compounding the financial results of each company. The rationale for doing so is to match the data collected on each company with the data collected on the other company (in terms of time of occurrence). In other words, an analyst must first compound the financial data of the trailing twelve months of each company to make sure that he is comparing apples to apples.

## **LOS 11b: calculate and interpret activity, liquidity, solvency, and profitability ratios**

Financial ratios are used to express one financial quantity regarding another. Financial ratios can assist with company and security valuations, stock selections, and forecasting.

A variety of categories may be used to classify financial ratios. Although the names of these categories and the ratios included in each can vary significantly, common categories used include activity, liquidity, solvency, profitability, and valuation ratios. Each category measures a different aspect of a company's business. However, all categories are essential in evaluating a company's ability to generate cash flows from its business operations.

Financial ratios require contextual interpretation. Typically, they are compared with:

- **Prior Period Results:** Trend analysis can highlight whether a company's performance and financial position are improving or deteriorating over time.
- **Expectations:** These are forecasts or estimates for key metrics like sales growth, profit margins, and leverage ratios set by the analyst or external analysts before the actual results are published. Variances from these expectations should be analyzed to adjust forecasts for future periods.
- **Industry Peers and Competitors (Cross-Sectional Analysis):** Comparing a company with others in its industry involves relating its financial ratios to industry norms or a subset of companies in the same industry. When using industry norms, several considerations should be kept in mind:
  - Companies may operate in multiple lines of business, which can distort aggregate financial ratios. It's better to examine industry-specific ratios for each line of business.
  - Different business models and corporate strategies can impact certain financial ratios.
  - Some ratios are specific to certain industries and may not be relevant across all industries.

- Variations in accounting methods used by different companies can distort financial ratios.
- **Company Goals and Strategy:** Actual financial ratios can be compared with the company's goals to assess whether these objectives are being met and if the results align with the company's strategy.
- **Economic Conditions:** For cyclical companies, financial ratios generally improve when the economy is strong and declines during recessions. Therefore, financial ratios should be evaluated in the context of the current phase of the business cycle.

## Activity Ratios

Activity ratios are also known as asset utilization ratios or operating efficiency ratios. They measure how efficiently a company performs daily tasks, such as managing various assets. These ratios generally combine income statement information in the numerator and balance sheet information in the denominator.

The list below describes the most commonly used activity ratios.

### **Inventory Turnover and Days of Inventory on Hand (DOH)**

Inventory turnover is calculated as

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Average inventory}}$$

Inventory turnover reflects the amount of resources invested in inventory, also called the carrying costs, and can serve as an indicator of inventory management effectiveness.

On the other hand, DOH is calculated as:

$$\text{DOH} = \frac{\text{Number of days in period}}{\text{Inventory turnover}}$$

The ratio can also be used to measure the effectiveness of inventory management.

## **Receivables Turnover and Days of Sales Outstanding (DSO)**

Receivables turnover is given by:

$$\text{Receivables turnover} = \frac{\text{Revenue}}{\text{Average receivables}}$$

The receivable turnover ratio measures the efficiency of a company's credit and collection processes. A relatively high receivables turnover ratio may indicate a company has highly efficient credit and collections. Similarly, it could imply that a company's credit or collection policies are too stringent.

On the other hand, the day of sales outstanding is calculated as:

$$\text{DSO} = \frac{\text{Number of days in period}}{\text{Receivables turnover}}$$

DSO measures the time that elapses between a sale and cash collection. It reflects how fast a company collects cash from customers to whom it extends credit. A low DSO indicates that a company is efficient in its credit and collection processes.

Similar to inventory management, comparing the company's sales growth to the industry can help analysts determine if sales are being lost due to strict credit policies. Additionally, comparing the company's estimates of uncollectible accounts receivable and actual credit losses with past experiences and peer companies can help assess whether low turnover is due to credit management issues.

## **Payables Turnover and Number of Days of Payables**

Payables turnover is calculated as:

$$\text{Payables turnover} = \frac{\text{Purchases}}{\text{Average trade payables}}$$

Payables turnover measures the number of times a company theoretically pays off all its creditors per year.

On other hand, the number of days of payables is computed as:

$$\text{Number of days of payables} = \frac{\text{Number of days in period}}{\text{Payables turnover}}$$

The number of payable days reflects the average number of days a company takes to pay its suppliers.

A high payables turnover ratio (low days payable) compared to the industry might suggest that the company is not fully utilizing available credit facilities or is taking advantage of early payment discounts. Conversely, a low turnover ratio (high days payable) could signal difficulties in making timely payments or taking advantage of lenient supplier terms.

In such cases, examining other ratios simultaneously is beneficial. If liquidity ratios show the company has enough cash and short-term assets to meet obligations while having a high days payable ratio, the analyst might lean towards lenient supplier credit and collection policies as the reason.

## Working Capital Turnover

Working capital turnover is calculated as

$$\text{Working capital turnover} = \frac{\text{Revenue}}{\text{Average working capital}}$$

Working capital turnover indicates how efficiently a company generates revenue with its working capital. According to the formula for working capital turnover, a working capital turnover ratio of 5.0, for example, means that the company produces USD 5 of revenue for every USD 1 of working capital. As such, a high working capital turnover ratio indicates greater efficiency.

Note that working capital can be close to zero or even negative for some companies, making the working capital turnover ratio difficult to interpret accurately.

## Fixed Asset Turnover

Fixed asset turnover is calculated as:

$$\text{Fixed asset turnover} = \frac{\text{Revenue}}{\text{Average net fixed assets}}$$

Fixed asset turnover measures how efficiently a company generates revenues from its investments in fixed assets. A higher fixed asset turnover ratio indicates a more efficient use of fixed assets in generating revenue.

## Total Asset Turnover

Total asset turnover is defined as:

$$\text{Total asset turnover} = \frac{\text{Revenue}}{\text{Average total assets}}$$

Total asset turnover measures a company's overall ability to generate revenues with a given level of assets. That is, a total asset turnover ratio of 1.50 would indicate that the company generates USD 1.20 in revenue for every USD 1 of average assets. As such, a low asset turnover ratio can indicate inefficiency or the company's relative capital intensity.

Since this total asset turnover ratio includes fixed and current assets, inefficient working capital management can distort overall interpretations. Therefore, it's beneficial to analyze working capital and fixed asset turnover ratios separately.

A low asset turnover ratio may indicate inefficiency or the relative capital intensity of the business. The ratio also reflects strategic decisions by management, such as whether to adopt a more labor-intensive and less capital-intensive approach or a more capital-intensive and less labor-intensive approach to its operations.

### Example: Interpreting DSO and DOH

ABC Corporation is a fictional manufacturing firm. To analyze management's operational efficiency, an analyst gathers the following activity ratios from a reliable data source.

Ratio	2019	2018	2017	2016
Days of Inventory Held (DOH)	34.21	39.30	41.80	47.10
Days Sales Outstanding (DSO)	44.00	55.30	50.20	75.50
Total Asset Turnover	0.40	0.32	0.25	0.21

Which of the following statements best explains the decrease in DOH from 39.30 in 2018 to 34.21 in 2019 for ABC Corporation?

- A. The company increased its sales significantly in 2019.
- C. The company extended its credit terms to customers.
- B. The company reduced its inventory levels due to an inventory correction.

### Solution

The correct answer is **C**.

The decrease in DOH is primarily due to an inventory correction, where the company recorded an allowance for the decline in market value and obsolescence of inventory. DOH (Days of Inventory Held) is calculated as:

$$DOH = \frac{\text{Number of days in period}}{\text{Inventory turnover}}$$

where,

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Average inventory}}$$

When the company reduces the value of its inventory due to an allowance for obsolescence, the numerator (Average Inventory) decreases, leading to a lower DOH.

**A is incorrect.** While increased sales can impact various metrics, the primary reason for the decrease in DOH was the inventory correction and allowance, which directly affected the numerator in the DOH formula.

**B is incorrect.** Extending credit terms would primarily affect DSO (Days Sales Outstanding), not

DOH. DSO is calculated as:

$$DSO = \frac{\text{Number of days in period}}{\text{Receivables turnover}}$$

where

$$\text{Receivables turnover} = \frac{\text{Revenue}}{\text{Average receivables}}$$

Extending credit terms would increase Accounts Receivable, impacting DSO rather than DOH.

## Liquidity Ratios

Liquidity ratios measure a company's ability to satisfy its short-term obligations. These ratios reflect a company's position at a point in time. They, therefore, usually use ending balance sheet data rather than averages. The list below describes the most commonly used liquidity ratios.

### Current Ratio

The current ratio is calculated as follows:

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

A higher current ratio signifies greater liquidity, indicating a stronger ability to meet short-term obligations. Conversely, a lower current ratio suggests less liquidity, implying a higher dependency on operating cash flow and external financing to fulfill short-term obligations. The current ratio assumes that inventories and accounts receivable are liquid.

### Quick Ratio

The quick ratio is calculated as:

$$\text{Quick ratio} = \frac{\text{Cash} + \text{Short-term marketable investments} + \text{Receivables}}{\text{Current liabilities}}$$

A higher quick ratio indicates a higher level of liquidity or ability to meet short-term obligations. It is a better indicator of liquidity than the current ratio in instances where inventory is illiquid.

The quick ratio is more conservative than the current ratio because it includes only the more liquid current assets, also known as "quick assets," in relation to current liabilities. Similar to the current ratio, a higher quick ratio indicates greater liquidity.

By being conservative, it implies that quick ratio takes into account that certain current assets, such as prepaid expenses, some taxes, and employee-related prepayments, represent costs paid in advance and cannot usually be converted back into cash. It also considers that inventory might not be easily and quickly converted into cash and that a company might not be able to sell all its inventory at its carrying value, especially if required to do so quickly.

Therefore, in situations where inventories are illiquid, as indicated by low inventory turnover ratios, the quick ratio may provide a better indication of liquidity than the current ratio.

## Cash Ratio

Cash ratio is defined as:

$$\text{Cash ratio} = \frac{\text{Cash} + \text{Short-term marketable investments}}{\text{Current liabilities}}$$

The cash ratio is typically a reliable measure of an entity's liquidity during a crisis because it includes only highly marketable short-term investments and cash. However, during a general market crisis, the fair value of marketable securities could drop significantly due to market factors, which might render this ratio less reliable.

## Defensive Interval Ratio

The defensive interval ratio is computed as follows:

$$\text{Defensive interval ratio} = \frac{\text{Cash} + \text{Short-term marketable investments} + \text{Receivables}}{\text{Daily cash expenditures}}$$

The defensive interval ratio measures how long a company can pay its daily expenditures using only its existing liquid assets without any additional cash inflow.

## **Cash Conversion Cycle (or Net Operating Cycle)**

The cash conversion cycle is calculated using the following formula:

$$\text{Cash conversion cycle} = \text{DOH} + \text{DSO} - \text{Number of days of payables}$$

The cash conversion cycle metric measures the time span from when a company invests in working capital until it collects cash.

A shorter cash conversion cycle indicates higher liquidity, meaning the company only needs to finance its inventory and accounts receivable for a brief period. Conversely, a longer cash conversion cycle signals lower liquidity, suggesting that the company must finance its inventory and accounts receivable for an extended period, potentially requiring more capital to fund current assets.

## **Solvency Ratios**

Solvency ratios measure a company's ability to satisfy its long-term obligations. They provide information about the relative debt amount in a company's capital structure. Moreover, they reveal the adequacy of a company's earnings and cash flow to cover interest expenses and other fixed charges as they fall due.

There are two types of solvency ratios: debt ratios, which focus on the balance sheet and measure the amount of debt capital relative to equity capital, and coverage ratios, which focus on the income statement and measure the ability of a company to cover its debt payments. Both ratios help assess a company's solvency and evaluate the quality of its bonds and other debt obligations.

Below is a list of the most used solvency ratios (Debt Ratios).

### **Debt-to-Assets Ratio**

By the name, the debt-to-asset ratio is calculated as:

$$\text{Debt-to-Asset ratio} = \frac{\text{Total debt}}{\text{Total assets}}$$

Debt-to-Asset ratio measures the percentage of a company's total assets financed with debt. A higher ratio implies higher financial risk and weaker solvency.

## **Debt-to-Capital Ratio**

Debt-to-capital ratio is computed as:

$$\text{Debt-to capital ratio} = \frac{\text{Total debt}}{\text{Total debt} + \text{Total shareholders' equity}}$$

Debt-to-capital ratio measures the percentage of a company's capital (debt + equity) represented by debt. A higher ratio implies higher financial risk and weaker solvency.

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

The debt-to-equity ratio is calculated as:

$$\text{Debt-to-equity ratio} = \frac{\text{Total debt}}{\text{Total shareholders' equity}}$$

The debt-to-equity ratio measures the amount of debt capital relative to equity capital. A higher ratio implies higher financial risk and weaker solvency.

## **Financial Leverage Ratio**

Financial leverage ratio is defined as:

$$\text{Financial leverage ratio} = \frac{\text{Average total assets}}{\text{Average total equity}}$$

This measures the number of total assets that are supported for each money unit of equity. The higher the ratio, the more leveraged the company uses debt and other liabilities to finance

assets.

## Debt-to-EBITDA Ratio

The formula for debt-to-EBITDA is given by:

$$\text{Debt-to-EBITDA} = \frac{\text{Total or net debt}}{\text{EBITDA}}$$

The debt-to-EBITDA ratio calculates the years needed to repay total debt using EBITDA (an approximation of operating cash flow). It's often used in debt covenants between issuers and investors.

The coverage ratios include:

## Interest Coverage Ratio

Calculated as:

$$\text{Interest coverage} = \frac{\text{EBIT}}{\text{Interest payments}}$$

Interest coverage measures the number of times a company's EBIT could cover its interest payments. A higher ratio indicates more robust solvency.

## Fixed-charge Coverage Ratio

Fixed-charge coverage is calculated as:

$$\text{Fixed-charge coverage ratio} = \frac{\text{EBIT} + \text{Lease payments}}{\text{Interest payments} + \text{Lease payments}}$$

The fixed-charge coverage ratio measures the number of times a company's earnings (before interest, taxes, and lease payments) can cover its interest and lease payments. A higher ratio indicates more robust solvency.

## Example: Calculating Financial Leverage

HydroElec, a Canadian public utility, is being assessed for solvency by a credit analyst based on financial statements for the year ending 31 December 2023. The following data has been extracted from the company's 2023 annual report:

Item	2023	2021	2020
Total Assets	850,000	790,000	720,000
Short-Term Debt	25,000	20,000	18,000
Long-Term Debt	400,000	350,000	300,000
Total Liabilities	600,000	550,000	500,000
Total Equity	250,000	240,000	220,000

Which of the following best describes the trend in HydroElec's financial leverage from 2021 to 2023?

- A. The financial leverage increased, indicating higher risk.
- B. The financial leverage remained the same.
- C. The financial leverage decreased, indicating lower risk.

**Solution:**

The correct answer is **A**.

We start by calculating financial leverage for each year. To determine HydroElec's financial leverage, we calculate the average total assets and average total equity for the years 2021 and 2023. The average total assets for 2023 are:

$$\text{Average Total Assets 2023} = \frac{850,000 + 790,000}{2} = 820,000$$

The average total equity for 2023 is:

$$\text{Average Total Equity 2023} = \frac{250,000 + 240,000}{2} = 245,000$$

The financial leverage ratio for 2023 is then:

$$\text{Financial Leverage 2023} = \frac{820,000}{245,000} = 3.35$$

For 2021, the average total assets were:

$$\text{Average Total Assets 2021} = \frac{790,000 + 720,000}{2} = 755,000$$

The average total equity for 2021 was:

$$\text{Average Total Equity 2021} = \frac{240,000 + 220,000}{2} = 230,000$$

The financial leverage ratio for 2021 was:

$$\text{Financial Leverage 2021} = \frac{755,000}{230,000} = 3.28$$

The trend indicates an increase in financial leverage from 3.28 in 2021 to 3.35 in 2023, suggesting a rise in financial risk.

**B is incorrect.** The financial leverage ratio actually increased, not remained the same.

**C is incorrect.** The financial leverage ratio increased, indicating a higher level of risk.

## Profitability Ratios

Profitability ratios measure a company's ability to generate profits from its resources (assets). There are two types of profitability ratios: (i) return-on-sales profitability ratios, which express various sub-totals on the income statement as a percentage of revenue, and (ii) return-on-investment profitability ratios, which measure income relative to the assets, equity, or total capital employed by a company.

The list below describes the most used solvency ratios:

### Gross Profit Margin

Definition:

$$\text{Gross profit margin} = \frac{\text{Gross profit}}{\text{Revenue}}$$

Gross profit margin indicates the percentage of revenue available to cover operating and other expenses and generate profit. A higher gross profit margin indicates a combination of higher product pricing and lower product costs.

## Operating Profit Margin

Definition:

$$\text{Operating profit margin} = \frac{\text{Operating income}}{\text{Revenue}}$$

An operating profit margin that increases faster than the gross profit margin can indicate improvements in controlling operating costs, such as administrative overheads. On the other hand,

## Pretax Margin

Definition:

$$\text{Pretax margin} = \frac{\text{EBT}}{\text{Revenue}}$$

Pretax margin reflects the effect on the profitability of leverage and other non-operating income and expenses.

If a company's pretax margin rises mainly due to increasing non-operating income, the analyst should assess whether this growth indicates a strategic shift in the company's business focus and evaluate the likelihood of its continuation.

## Net Profit Margin

$$\text{Net profit margin} = \frac{\text{Net income}}{\text{Revenue}}$$

Net profit margin measures how much each dollar collected as revenue translates into profit.

### **Return on Assets (ROA)**

Return on Assets (ROA) evaluates the earnings a company generates from its assets. A higher ROA indicates that the company is efficiently generating more income with a given asset level. This ratio is commonly calculated as follows:

$$\text{ROA} = \frac{\text{Net Income}}{\text{Average Total Assets}}$$

A potential issue with this calculation is that net income represents returns to equity holders, while assets are funded by both equity and debt. Since interest expense is subtracted in the numerator, some analysts prefer to add back interest expense, adjusted for taxes, as follows:

$$\text{Adjusted ROA} = \frac{\text{Net Income} + \text{Interest Expense} \times (1 - \text{Tax Rate})}{\text{Average Total Assets}}$$

Alternatively, some analysts use a pre-interest and pre-tax basis to calculate operating ROA, given by:

$$\text{Operating ROA} = \frac{\text{Operating Income (EBIT)}}{\text{Average Total Assets}}$$

Operating ROA measures returns before deducting interest on debt, reflecting the return on all invested assets, regardless of how they are financed.

### **Return on Invested Capital**

Definition:

$$\text{Return on Invested Capital} \\ \text{EBIT} \times (1 - \text{Effective tax rate}) \\ = \frac{}{\text{Average total short and long-term debt and equity}}$$

Return on invested capital (ROIC) assesses a company's after-tax profitability on all its employed capital, including short-term debt, long-term debt, and equity. It's calculated before deducting interest on debt capital, similar to operating ROA.

## Return on Equity (ROE)

Definition:

$$\text{Return on Equity} = \frac{\text{Net income}}{\text{Average total equity}}$$

ROE measures the return a company earns on its equity capital, including minority equity, preferred equity, and common equity.

## Return on Common Equity

Definition:

$$\text{Return on Common Equity} = \frac{\text{Net income} - \text{Preferred dividends}}{\text{Average common equity}}$$

Return on common equity measures the return earned by a company only on its common equity.

### Example: Evaluation of a Company Using Ratio Analysis

The following information on a company is provided for the periods ended December 31, 2015, and December 31, 2016.

Ratios	December 31, 2016	December 31, 2015
Return on equity	5.75%	4.12%
Return on assets	3.17%	2.98%
Current ratio	2.13	1.53
Inventory turnover	5.8	1.7
Net profit margin	3.23%	1.56%
Debt-to-assets	56.23%	65.00%

Evaluate the performance of the company using ratio analysis

## **Solution**

The table demonstrates that overall, the company's performance improved from 2015 to 2016.

This is highlighted by:

- An increase in profitability is indicated by increases in the values of the ROE, ROA, and net profit margin ratios;
- An increase in liquidity as indicated by the increase in the current ratio;
- The increase in the inventory turnover ratio evidences an increase in asset utilization.
- Stronger solvency as evidenced by the decrease in the debt-to-assets ratio.

## Question 1

You have been provided with the following information on Company ABC for the year 2020:

Revenue: \$5,276,987;

Gross profit: \$3,534,099; and

Net income: \$2,956,123.

Company ABC's net profit margin is *closest to*:

- A. 56.02%.
- B. 66.97%
- C. 83.64%

### Solution

**The correct answer is A.**

$$\text{Net profit margin} = \frac{\text{Net income}}{\text{Revenue}} = \frac{\$2,956,123}{\$5,276,987} = 56.02\%$$

## Question 2

Which of the following categories of ratios could be used to evaluate a company's ability to repay a bank loan?

- A. Liquidity ratios.
- B. Solvency ratios.
- C. Profitability ratios.

### Solution

**The correct answer is B.**

Solvency ratios measure a company's ability to meet long-term obligations such as bank loans and bond obligations.

**A is incorrect.** Liquidity ratios measure a company's ability to satisfy its short-term obligations.

**C is incorrect.** Profitability ratios measure a company's ability to generate profits from its resources (assets).

## **LOS 11c: describe relationships among ratios and evaluate a company using ratio analysis**

Recall that financial ratios express one financial quantity concerning another and can be used to evaluate a company's performance over time. By reducing the effect of company size, ratios can also enhance comparison between companies.

## **Financial Ratio Relationships**

It is crucial to examine a variety of financial ratios rather than focusing on a single ratio or category in isolation to understand a company's overall position and performance. Experience indicates that insights from one ratio category can clarify questions raised by another. The most accurate overall picture emerges by integrating information from all sources, providing a comprehensive understanding of the company's financial health.

Consider the following example.

### **Example: Contradicting Liquidity Ratios**

An analyst is assessing the liquidity of Maple Manufacturing, a Norwegian manufacturing company, and gathers the liquidity ratios and activity ratios shown below:

Ratio	2023	2022	2021
Current Ratio	2.1	1.9	1.6
Quick Ratio	0.8	0.9	1.0
Days of Inventory Held (DOH)	55	45	30
Days Sales Outstanding (DSO)	24	28	30

Which of the following best explains the observed change in Maple Manufacturing's liquidity ratios from 2021 to 2023?

- A. The company increased its cash holdings.
- B. The company improved its sales significantly.
- C. The company used proceeds from receivables to purchase inventory.

## Solution

The correct answer is **B**.

The ratios present a conflicting view of the company's liquidity. Based on the increase in its current ratio from 1.6 to 2.1, the company appears to have strong and improving liquidity; however, the decline in the quick ratio from 1.0 to 0.8 suggests that its liquidity is deteriorating. Since both ratios use current liabilities as the denominator, the difference must be due to changes in an asset included in the current ratio but not in the quick ratio, such as inventories.

The company's DOH has increased from 30 days to 55 days, indicating that the company is holding larger amounts of inventory relative to sales. Meanwhile, the decrease in DSO implies that the company is collecting receivables faster. If the proceeds from these collections were held as cash, there would be no effect on either the current ratio or the quick ratio. However, if the proceeds were used to purchase inventory, there would be no effect on the current ratio, but the quick ratio would decline, which matches the observed pattern.

Collectively, these ratios suggest that liquidity is declining and that the company may need to address an inventory management issue.

**A is incorrect.** If the company increased its cash holdings, both the current ratio and the quick ratio would improve.

**C is incorrect.** Improved sales might affect inventory levels and receivables, but the observed pattern in the liquidity ratios is not directly explained.

## Question 1

Which of the following statements is *least likely* accurate?

- A. It is necessary to use averages whenever only balance sheet items are included in a ratio.
- B. Evaluating a ratio's numerator and denominator can help determine what the ratio is attempting to measure and how it should be interpreted.
- C. Whenever an income statement item is represented in the numerator, and a balance sheet item is represented in the denominator of a ratio, it is advisable to use an average value of the balance sheet item in the denominator.

### Solution

**The correct answer is A.**

It is unnecessary to use averages whenever only balance sheet items are included in a ratio, as both should have been determined on the same date. Both statements in B and C are accurate.

## Question 2

Xena Corp reported the following information in its latest financial reports:

Inventory turnover at the beginning of the period: 10

Inventory turnover at the end of the period: 12

Gross profit margin: 30%(same as last year)

Revenue: \$3,000,000M (same as last year)

What conclusion can you *most likely* make out of this information?

- A. The company decreased its inventory.

- B. The company increased the total cost of goods sold.
- C. The total cost of goods sold for the company remained constant.

### **Solution**

**The correct answer is A.**

Considering that the inventory turnover ratio has changed, the company must have either increased the total cost of goods sold or decreased the held inventory during the period. The company's revenue and gross profit margin remained constant during the period, so it must have decreased its holding inventory.

## **LOS 11d: demonstrate the application of DuPont analysis of return on equity and calculate and interpret effects of changes in its components**

Recall that, return on equity (ROE) measures the return a company generates on its equity capital. To understand the factors driving a company's ROE, it is helpful to decompose ROE into its component parts, a technique often referred to as DuPont analysis, originally developed by DuPont.

DuPont analysis involves expressing the basic ratio of net income divided by average shareholders' equity as the product of several component ratios. Each of these component ratios reflects a distinct aspect of the company's performance that influences ROE.

So what is the significance of DuPont analysis? Decomposing ROE helps evaluate how different aspects of performance, such as efficiency, operating profitability, taxes, and financial leverage, impact the company's profitability. Moreover, DuPont analysis is valuable for understanding changes in ROE over time for a particular company and for comparing ROE between different companies during a specific period.

Lastly, management can use the analysis to identify areas for improvement to enhance ROE since DuPont analysis highlights the interconnectedness of various financial ratios and their collective influence on the return generated for the company's equity investors.

## **Decomposition of ROE (DuPont Analysis)**

Analysts have devised various methods for decomposing ROE (Return on Equity). One of the most commonly used methods involves decomposing ROE into two components. Recall that:

$$\text{ROE} = \frac{\text{Net income}}{\text{Average shareholders' equity}}$$

We can decompose ROE as follows:

### **Method 1:**

.....

$$\begin{aligned}
 \text{ROE} &= \frac{\text{Net income}}{\text{Average shareholders' equity}} \\
 &= \left( \frac{\text{Net income}}{\text{Average total assets}} \right) \times \left( \frac{\text{Average total assets}}{\text{Average shareholders' equity}} \right) \\
 \Rightarrow \text{ROE} &= \text{Return on Assets (ROA)} \times \text{Leverage}
 \end{aligned}$$

This implies that ROE is determined by a company's ROA and its financial leverage. As such, a company can boost its ROE by either enhancing its ROA or by increasing its leverage.

Recall that leverage is calculated as average total assets divided by average shareholders' equity. If a company had no leverage (no liabilities), its leverage ratio would be 1.0, making ROE equal to ROA. As a company assumes more liabilities, its leverage increases.

As long as a company can borrow at a rate lower than the return it earns on the borrowed funds, it is effectively using leverage, which increases ROE. Conversely, if the borrowing cost exceeds the return on investment, increased leverage will decrease ROE because borrowing would reduce ROA.

## **Method 2:**

Just as ROE can be decomposed, its individual components, like ROA, can also be broken down. By further decomposing ROA, we can express ROE as a product of three component ratios:

$$\begin{aligned}
 \text{ROE} &= \frac{\text{Net income}}{\text{Average shareholders' equity}} \\
 &= \left( \frac{\text{Net income}}{\text{Revenue}} \right) \times \left( \frac{\text{Revenue}}{\text{Average total assets}} \right) \\
 &\quad \times \left( \frac{\text{Average total assets}}{\text{Average shareholders' equity}} \right) \\
 \Rightarrow \text{ROE} &= \text{Net profit margin} \times \text{Total asset turnover} \times \text{Leverage}
 \end{aligned}$$

This decomposition illustrates that a company's ROE is influenced by its net profit margin, efficiency, and leverage.

The net profit margin indicates profitability by showing how much income a company earns per monetary unit (e.g., euro or US dollar) of sales. The asset turnover ratio reflects efficiency by measuring how much revenue a company generates per monetary unit of assets.

Essentially, ROA is decomposed into net profit margin and total asset turnover. A company's ROA is thus a function of its profitability (net profit margin) and efficiency (total asset turnover).

The third term on the right-hand side of the equation is the equity multiplier, which measures financial leverage by indicating the total amount of a company's assets relative to its equity capital.

### **Method 3:**

To further separate the effects of taxes and interest, the net profit margin can further be decomposed, leading to:

$$\begin{aligned}
 \text{ROE} &= \frac{\text{Net income}}{\text{Average shareholders' equity}} \\
 &= \left( \frac{\text{Net income}}{\text{EBT}} \right) \times \left( \frac{\text{EBT}}{\text{EBIT}} \right) \times \left( \frac{\text{EBIT}}{\text{Revenue}} \right) \\
 &\quad \times \left( \frac{\text{Revenue}}{\text{Average total assets}} \right) \\
 &\quad \times \left( \frac{\text{Average total assets}}{\text{Average shareholders' equity}} \right) \\
 \Rightarrow \text{ROE} &= \text{Tax burden} \times \text{Interest Burden} \times \text{EBIT margin} \\
 &\quad \times \text{Total asset turnover} \times \text{Leverage}
 \end{aligned}$$

This 5-way decomposition is the Dupont Analysis method found in financial databases such as Bloomberg.

The tax burden measures the impact of taxes on ROE, representing one minus the average tax rate, or the portion of a company's pretax profits that it retains. In other words, tax burden can be expressed in decimal or percentage form. For example, a 35 percent tax rate would yield a factor of 0.65 or 65%. Consequently, a higher value for the tax burden indicates that the company retains a larger portion of its pretax profits, reflecting a lower tax rate. Conversely, a decrease in the tax burden ratio indicates a higher tax rate, leaving the company with a smaller portion of its pretax profits.

The interest burden reflects the impact of interest on ROE, with higher borrowing costs leading to a reduction in ROE. Some analysts prefer using operating income instead of EBIT for this term and the following one. Either operating income or EBIT is acceptable if used consistently. In such

cases, the second term would measure both the impact of interest expense and non-operating income on ROE.

EBIT margin measures the effect of operating margin if operating income is used or EBIT margin if EBIT is used on ROE. This term primarily assesses the impact of operating profitability on ROE.

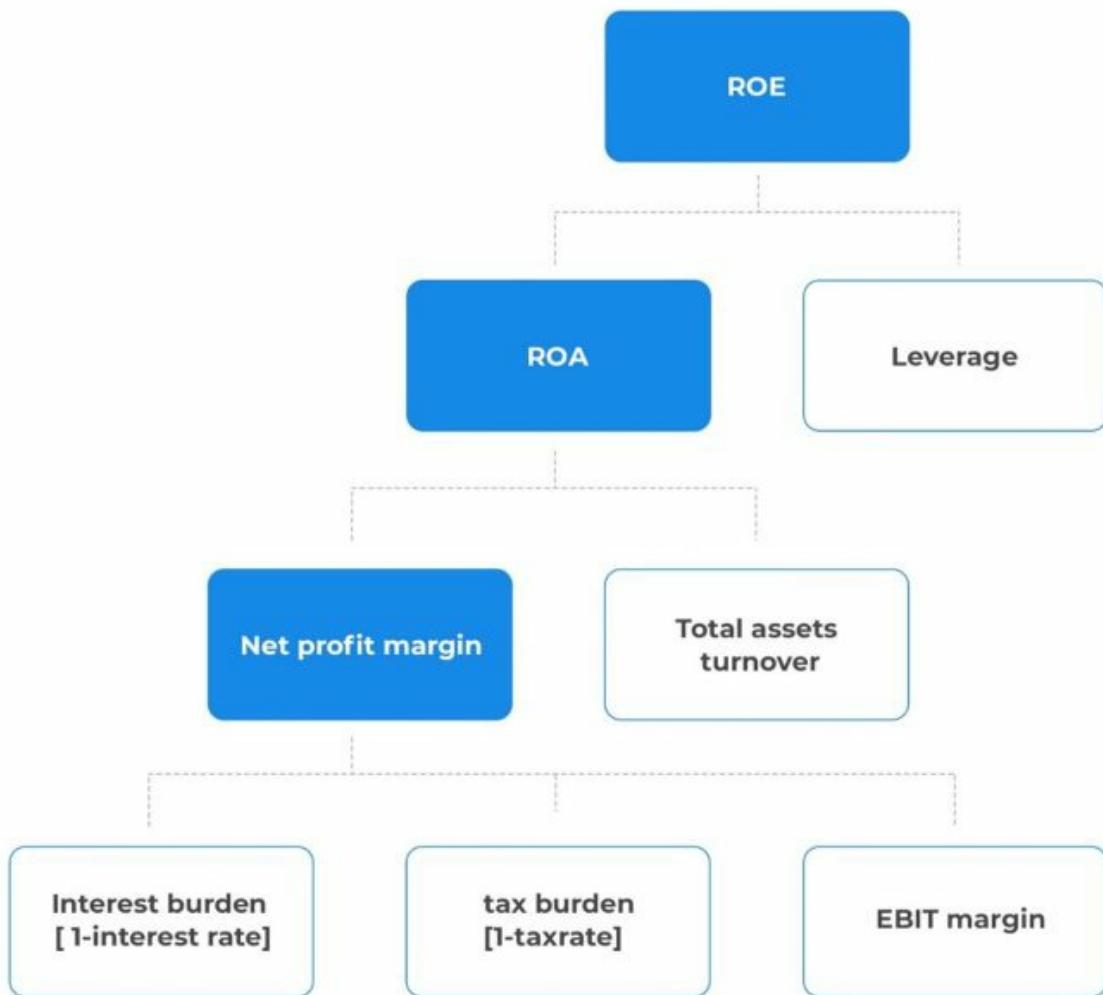
The total asset turnover ratio indicates the overall efficiency of the company in generating revenue per unit of total assets.

The financial leverage ratio measures the total amount of a company's assets relative to its equity capital.

The figure below illustrates the idea behind DuPont's analysis.



## DuPont Analysis



## Question 1

Given the following financial data, what is the company's ROE?

Net income	50,000
Revenue	285,000
Average total assets	1,000,000
Average shareholder's equity	600,000

- A. 5.29%
- B. 8.33%
- C. 1.14%

### Solution

The correct answer is B.

$$\text{ROE} = \left( \frac{\text{Net income}}{\text{Revenue}} \right) \times \left( \frac{\text{Revenue}}{\text{Average total assets}} \right)$$

$$\times \left( \frac{\text{Average total assets}}{\text{Average shareholders' equity}} \right)$$

$$\text{ROE} = \left( \frac{50,000}{285,000} \right) \times \left( \frac{285,000}{1,000,000} \right) \times \left( \frac{1,000,000}{600,000} \right)$$

$$= 0.1754 \times 0.285 \times 1.667 = 8.33\%$$

## **LOS 11e: describe the uses of industry-specific ratios used in financial analysis**

There is no universally accepted definition or classification of ratios. Ratios indicate a company's performance and value, but their significance varies by industry. Industry-specific ratios, like same-store sales changes in retail, help distinguish growth sources. In regulated sectors like banking, specific regulatory ratios, like liquidity and capital adequacy, reflect compliance and risk exposure. Industry-specific metrics are crucial, especially in early-stage industries with unprofitable companies.

**The following presents some examples of industry-specific ratios.**

### Business Risk Ratio

Coefficient of variation of operating income	$\frac{\text{Standard deviation of operating income}}{\text{Average operating income}}$
Coefficient of variation of net income	$\frac{\text{Standard deviation of net income}}{\text{Average net income}}$
Coefficient of variation of revenues	$\frac{\text{Standard deviation of revenue}}{\text{Average revenue}}$

### Financial Sector Ratios

Capital adequacy	$\frac{\text{Various components of capital}}{\text{Various measures*}}$
Monetary reserve requirement	$\frac{\text{Reserves held at central bank}}{\text{Specified deposit liabilities}}$
Liquid asset requirement	$\frac{\text{Approved "readily marketable" securities}}{\text{Specified deposit liabilities}}$
Net interest margin	$\frac{\text{Net interest income}}{\text{Total interest-earning assets}}$

Various measures\* such as market risk, risk-weighted assets, or level of operational risk assumed

### Retail Ratios

Comparable (or same) store sales	$\frac{\text{Average revenue growth year over year for stores open in both periods}}{\text{Revenue}}$
Sales per square meter (or square foot)	$\frac{\text{Revenue}}{\text{Total retail space in square meters (feet)}}$

### Service Industry Ratios

Revenue per employee	$\frac{\text{Revenue}}{\text{Total number of employees}}$
Net income per employee	$\frac{\text{Net income}}{\text{Total number of employees}}$

### Hotel Industry Ratios

Average daily rate	$\frac{\text{Revenue}}{\text{Number of rooms sold}}$
Occupancy rate	$\frac{\text{Number of rooms sold}}{\text{Number of rooms available}}$

### Relationship or Subscription-based Firms Ratios

Average revenue per user (ARPU)	$\frac{\text{Revenue}}{\text{Average number of users or subscribers}}$
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## Question

What do liquidity and cash reserve ratios primarily indicate in the banking sector?

- A. Liquidity and cash reserve ratios reflect the efficiency of loan origination and credit risk assessment.
- B. Liquidity and cash reserve ratios provide insights into a bank's liquidity and compliance with monetary and regulatory requirements.
- C. Liquidity and cash reserve ratios measure a bank's profitability and return on equity.

## Solution

**B is correct.** Liquidity and cash reserve ratios in the banking sector primarily indicate a bank's liquidity position and adherence to monetary and regulatory requirements. These ratios assess the bank's ability to meet short-term obligations and maintain financial stability.

## **LOS 11f: describe how ratio analysis and other techniques can be used to model and forecast earnings**

Analysts often need to forecast future financial performance, such as EPS forecasts and equity valuations. This process involves using data about the economy, industry, and company alongside the results of financial analyses like common-size and ratio analyses and the judgment of analysts.

Analysts can build models based on growth forecasts and expected relationships among financial statement data to forecast future performance. This involves creating budgets and pro forma financial statements, which are particularly useful for senior executives and boards of directors. These forecasts are also crucial for presentations to credit analysts and in securing external financing.

## **Modeling and Forecasting Earnings**

Forecasting usually involves a range of possibilities, and several techniques may be utilized for this purpose. Various techniques can be used for this purpose:

- **Sensitivity Analysis:** Also known as "what if" analysis, sensitivity analysis shows the range of possible outcomes as specific assumptions are changed. This can influence financing needs or investment in fixed assets.
- **Scenario Analysis:** This analysis shows the changes in key financial quantities resulting from specific events, such as the loss of customers or a catastrophic event. If the events are mutually exclusive and exhaustive, and probabilities can be assigned, the analyst can evaluate the range of outcomes and standard statistical measures like the mean and median values.
- **Simulation:** This involves computer-generated sensitivity or scenario analysis based on probability models for the factors driving outcomes. Each possible outcome is assigned a probability, and multiple scenarios are run to determine an expected outcome for each variable.

## Question 1

Which of the following statements is the *least* accurate?

- A. Forecasts should be limited to a single-point estimate.
- B. Scenario analysis shows the change in key financial quantities that may result from given (economic) events.
- C. Financial analysis, analyst judgment, and analysis of other information are all integral to the development of forecasts.

### Solution

The correct answer is A.

Forecasts should not be limited to a single-point estimate. Instead, they should focus on a range of possibilities.

Both options, B and C, are accurate statements.

## Question 2

Sensitivity analysis:

- A. Shows the results of the change of key financial quantities.
- B. Makes estimations of how future financial statements should look like.
- C. Shows the range of possible outcomes as specific assumptions are changed.

### Solution

The correct answer is C.

Sensitivity analysis shows a range of possible outcomes as specific assumptions are changed.