R20 Financial Analysis Techniques

Version 1.0

1. Introduction

Financial analysis is a useful tool in evaluating a company's performance and trends. The primary source of data is the company's annual reports, financial statements, and MD&A. An analyst must be capable of using a company's financial statements along with other information such as economy/industry trends to make projections and reach valid conclusions.

1.1 The Financial Analysis Process

Before beginning any financial analysis, an analyst must clarify the purpose and context of why it is needed. Once the purpose is defined, an analyst can choose the right techniques for the analysis. For example, the level of detail required for a substantial long-term investment in equities will be higher than one needed for a short-term investment in fixed income.

The Objectives of the Financial Analysis Process

This reading focuses on steps 3 and 4 of the financial analysis framework in detail: how to adjust financial statements, compute ratios, and produce graphs and forecasts. The processed data is then analyzed to arrive at a conclusion.

Financial Analysis Framework	
Phase	**Output of the phase**
1. Define purpose and context based on the analyst's function, client input, and organizational guidelines.	Objective Questions to be answered Nature and content of report to be provided Timetable and budget
2. Collect data: financial statements, other financial data, industry/economic data, discussions with management, suppliers, customers, and competitors.	Organized financial statements Financial tables Completed questionnaires
3. Process data	Adjusted financial statements Common-size statements Ratios and graphs Forecasts
4. Analyze and interpret processed data	Analytical results
5. Develop and communicate conclusions and recommendations	Report answering questions from phase 1 Recommendation regarding the purpose of the analysis
6. Follow-up	Updated recommendations

Distinguishing between Computation and Analysis

An effective analysis is not just a compilation of various pieces of information, tables, and graphs. It includes both calculations and interpretations. For analyzing past performance, an analyst computes several ratios, compares them against benchmarks, evaluates how the company performed, and determines the reasons behind its good/bad performance. Similarly, for a forward-looking analysis, an analyst must forecast and make recommendations after analyzing trends, management quality, etc.

2. Analytical Tools and Techniques

Various tools and techniques such as ratios, common size analysis, graphs, and regression analysis help in evaluating a company's performance. Evaluations require comparisons, but to make a meaningful comparison of a company's performance, the data needs to be adjusted first. An analyst can then compare a company's performance to other companies at any point in time (cross-section analysis) or its own performance over time (time-series analysis).

3. Financial Ratio Analysis

A ratio is an indicator of some aspect of a company's performance like profitability or inventory management that tells us what happened, but not why it happened. Ratios help in analyzing the current financial health of a company, evaluate its past performance, and provide insights for future projections. Calculating ratios is straightforward, but interpreting them is subjective.

Uses of ratio analysis

Ratios allow us to evaluate:
- operational efficiency.
- financial flexibility.
- changes in company/industry over time.
- company performance relative to industry.

Limitations of ratio analysis

Ratio analysis also has certain limitations. Some of the factors to consider include:
- Need to use judgment: An analyst must exercise judgment when interpreting ratios. All ratios must be viewed relative to one another. For example, a current ratio of 1.1 may not necessarily be good/bad unless viewed in perspective of other companies/industry.
- Use of alternate accounting methods: Using alternate methods may require adjustments before the ratios are comparable. For example, Company A might use the LIFO method to measure inventory, while a comparable company might use the FIFO method. Similarly, one company may use the straight line method of depreciation, while another may use an accelerated method.

- Nature of a company's business: Companies may have divisions operating in many different industries. This can make it difficult to find comparable ratios.
- Consistency of results of ratio analysis: One set of ratios may indicate a problem, while the other may indicate the problem is short term making the results inconsistent.

4 & 5. Common-Size Balance Sheet and Income Statements

Common-size financial statements are used to compare the performance of different companies within an industry or a company's performance over time. Common size statements are prepared by expressing every item in a financial statement as a percentage of a base item.

Common-Size Analysis of the Balance Sheet

There are two types of common-size balance sheets: **vertical** and **horizontal**.

Vertical common-size balance sheet

A vertical common-size balance sheet is prepared by dividing each item on the balance sheet by the total assets for a period and expressed as a percentage. This highlights the composition of the balance sheet.

$$\text{Vertical common-size balance sheet account (in \%)} = \frac{\text{Balance sheet account}}{\text{Total assets}} * 100$$

A simple common-size vertical balance sheet for Everest Inc. is shown below:

Vertical common-size (partial) balance sheet for Everest Inc.		
ASSETS	**2015**	**2014**
Cash and cash equivalents	10.81%	13.12%
Short-term marketable securities	1.24%	0.62%
Accounts receivable	7.50%	4.80%
Inventory	25.32%	25.97%
Other current assets	3.37%	2.14%
Property, plant, and equipment (PPE)	38.76%	40.06%
…………	……	…..
Other non- current assets	0.03%	0.02%
Total	100.00%	100.00%
EQUITY and LIABILITIES		
Short-term borrowing	0.46%	0%
Deferred tax liabilities	4.01%	4.20%
…..	…	…
Stockholder's equity	58.88%	60.13%
Equity and Liabilities	100.00%	100.00%

Time-Series Analysis

Trend analysis or time-series analysis provides information on historical performance and growth. It indicates how a particular item is changing – whether it is improving or deteriorating – relative to total assets over multiple periods. For the data given above, we can observe that inventory decreased as a percentage of total assets in 2015, while accounts receivable increased as a percentage of total assets.

Cross-Sectional Analysis

The vertical common-size balance sheet can be used in cross-sectional analysis (also called relative analysis) to compare a specific metric of one company with the same metric for another company or companies for a single time period. As illustrated in the table below, this method allows comparison across companies which might be of significantly different sizes and/or operate in different currencies.

	Everest Inc.		Alps Corp.	
		2015		**2015**
Cash and cash equivalents	10.81%	$3,500	9.00%	€1,755.00
Short-term marketable securities	1.24%	$400	4.00%	€780.00
Accounts receivable	7.50%	$2,430	5.20%	€1,014.00
Inventory	25.32%	$8,200	20.10%	€3,919.50
Other non-current assets	0.03%	$10	0.50%	€97.50
Total Assets	100.00%	$32,382	100.00%	€19,500.00

This presentation makes it easy to see that Alps Corp. has lower receivables as a percentage of total assets relative to Everest Inc. Alps Corp. also has lower inventory as a percentage of total assets relative to Everest Inc.

Horizontal Common-Size Balance Sheet

In a horizontal common-size balance sheet, each balance sheet item is shown in relation to the same item in a base year. Consider the following balance sheet excerpt for Everest Inc.:

	2014 (base year)	**2015**
Cash and cash equivalents	$3,800	$3,500
Short-term marketable securities	$180	$400
Inventory	$7,520	$8,200

The corresponding horizontal common size balance sheet will look like this:

	2014 (base year)	**2015**
Cash and cash equivalents	1.0	0.9
Short-term marketable securities	1.0	2.2
Inventory	1.0	1.1

Notice that the base-year value for all balance sheet items is set to 1. This makes it easy to see the percentage change in each item relative to the base year. For the data given above, cash decreased by 10% and inventory increased by 10%. An analysis of horizontal common-size balance sheets highlights structural changes that have occurred in a business.

Common-size Analysis of the Income Statement

A vertical common-size income statement divides each income statement element by revenue.

$$\text{Vertical common-size income statement account (in \%)} = \frac{\text{Income statement account}}{\text{Revenue}} * 100$$

Relationships in Financial Statements

Comparing the trend data of a horizontal common-size analysis across financial statements will give some insight into a company's financial standing. Consider the following percentage changes for a company to identify some potential issues:

Revenue: +15%, Operating income: +15%, Operating cash flow: -10%, Inventory: +60%, Receivables: +40%, Total assets: +30%

Some of the potential issues based on these numbers are:
- The assets are growing at a faster rate than revenue, which implies the company is spending more than the sales it is able to generate.
- Operating cash flow is negative whereas operating income is +15%, indicating a problem that the company is booking sales (accrual accounting) but has not realized the cash yet.
- Similarly, when inventory and receivables grow at a much faster pace than sales, it shows signs of poor inventory and receivables management.

6. The Use of Graphs and Regression Analysis

Graphs can be considered an extension of the financial analysis. It is a pictorial representation of the analysis done, be it ratio analysis or trend analysis. Analysts use appropriate graphs such as line charts and bar graphs based on the type of data to be shown. This helps in quick comparison of financial performance and structure over time.

Regression Analysis

Regression analysis, described in detail in Level II, is a statistical method of analyzing relationships (correlations) between variables.

7. Common Ratios Categories & Interpretation and Context

A large number of ratios are used to measure various aspects of performance. Commonly used financial ratios can be categorized as follows:

Category	What they measure	Example
Activity ratios	Efficiency of a company in performing its day-to-day operations.	$\dfrac{\text{Revenue}}{\text{Assets}}$
Liquidity ratios	A company's ability to meet its short-term obligations.	$\dfrac{\text{Current assets}}{\text{Current liabilities}}$
Solvency ratios	A company's ability to meet its long-term obligations.	$\dfrac{\text{Assets}}{\text{Equity}}$
Profitability ratios	A company's ability to generate profit from its resources.	$\dfrac{\text{Net Income}}{\text{Assets}}$
Valuation ratios	Quantity of an asset or flow per share.	$\dfrac{\text{Earnings}}{\text{Number of shares}}$

<u>Single statement ratios</u>: Note that for some ratios, the numerator and denominator are from the same statement (Income statement, balance sheet, or cash flow statement). For example, net profit margin (net income/sales) where both items are from the income statement.

<u>Mixed ratios</u>: For other ratios, the numerator is from one statement and the denominator is from another statement. An example is the asset turnover ratio (sales/assets) where the numerator is from the income statement and the denominator is from the balance sheet.

Interpretation and Context

As standalone numbers, the financial ratios of a company are not meaningful. The ratios are usually industry specific. For instance, one cannot compare the ratios of Schlumberger with that of Facebook. The financial ratios should be used to periodically evaluate a company's past performance (trend analysis) and its goals and strategy; how it fares against its peers in the industry (cross-sectional analysis); and the effect of economic conditions on its business.

8. Activity Ratios

Activity ratios measure how efficiently a company manages its assets. They are also known as **asset utilization ratios** or **operating efficiency** ratios. The activity ratios usually have an element from the income statement in the numerator and one from the balance sheet in the denominator. The average of the balance sheet element is *generally* taken because the balance sheet only shows the value at the end of the period, whereas the income statement measures what happened during the period.

Activity Ratios	Formula	Interpretation
Inventory turnover	$\dfrac{\text{Cost of goods sold}}{\text{Average inventory}}$	• Indicates how many times per period the entire inventory was sold. • Measures the ability of a company to sell its inventory. • Higher number means greater efficiency because inventory is kept

		for a shorter period. It could also mean insufficient inventory, which in turn, might affect growth/ revenue.
Days of inventory on hand	$\dfrac{\text{Number of days in period}}{\text{Inventory turnover}}$	• On an average, how many days of inventory is kept on hand.
Receivables turnover	$\dfrac{\text{Revenue}}{\text{Average receivables}}$	• Indicates how quickly a company collects cash. • More appropriate to use credit sales instead of revenue but it is not readily available. • A higher number means greater efficiency in credit and collection. It could also mean stringent cash collection policies are hurting potential sales.
Days of sales outstanding	$\dfrac{\text{Number of days in period}}{\text{Receivables turnover}}$	• Elapsed time between credit sale and cash collection. • Higher number means it takes a long time to collect receivables.
Payables turnover	$\dfrac{\text{Purchases}}{\text{Average trade payables}}$	• Indicates how quickly a company pays suppliers. • A high number means the company is paying suppliers quickly and is possibly not making use of credit facilities. • Low number may mean the company is facing trouble making payments on time and signal liquidity issues.
Number of days of payables	$\dfrac{\text{Number of days in period}}{\text{Payables turnover}}$	• On an average, how many days it takes to pay suppliers.
Working capital turnover	$\dfrac{\text{Revenue}}{\text{Average working capital}}$	• Indicates how efficiently a company generates revenue from working capital. • Working capital = current assets (CA) – current liabilities (CL) • Higher number means greater efficiency. If CA = CL, then working capital would be zero making the ratio meaningless.

Fixed asset turnover	$\dfrac{\text{Revenue}}{\text{Average net fixed assets}}$	• Indicates how efficiently a company generates revenue from fixed assets. • A higher number means efficient use of fixed assets. • A lower number may mean inefficiency, or newer business (higher carrying value on B/S), or a capital-intensive business.
Total asset turnover	$\dfrac{\text{Revenue}}{\text{Average total assets}}$	• Indicates how efficiently a company generates revenue from total assets (fixed + current assets). • As with other turnover ratios, higher number means efficiency.

Purchases = Cost of goods sold + Ending inventory – Beginning inventory

Instructor's Note: How to remember the activity ratios

1. Name of the ratio indicates the balance sheet item. For example, in the receivables turnover ratio, average receivables is the balance sheet item.

2. The income statement item is in the numerator.

3. Average value of the balance sheet item is in the denominator. An income statement measures an item over a period but a balance sheet indicates values of items only at the end of a period. So, analysts typically use the average value for balance sheet items.

4. Turnover ratios except inventory turnover and payables turnover use revenue in the numerator. Inventory turnover uses cost of goods sold, while payables turnover uses purchases.

Higher number for turnover ratios = greater efficiency
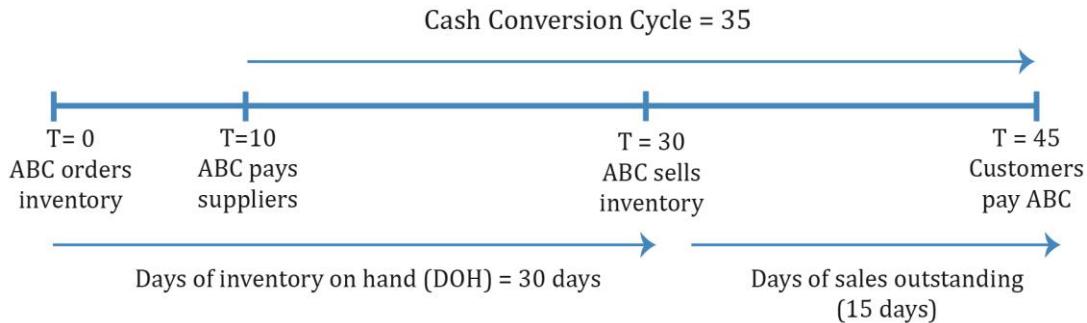
9. Liquidity Ratios

Liquidity ratios measure a company's ability to meet short-term obligations. It also indicates how quickly it turns assets into cash.

Liquidity Ratios		
Current ratio	$\dfrac{\text{Current assets}}{\text{Current liabilities}}$	A higher number implies greater liquidity.
Quick ratio	$\dfrac{\text{Cash } + \text{ marketable securities } + \text{ receivables}}{\text{Current liabilities}}$	A higher number implies greater liquidity. More conservative than current ratio as only more

		liquid current assets are included.
Cash ratio	$$\frac{\text{Cash } + \text{ marketable securities}}{\text{Current liabilities}}$$	This is the most conservative liquidity ratio and a good measure of a company's ability to handle a crisis situation.
Defensive interval ratio	$$\frac{\text{Cash } + \text{ marketable securities } + \text{ receivables}}{\text{Daily cash expenditures}}$$	Measures the number of days a company can operate before it runs out of cash. A higher number implies greater liquidity.
Cash conversion cycle (net operating cycle)	Days of inventory on hand (DOH) + days of sales outstanding (DSO) – number of days of payables	The time between cash paid (to suppliers) and cash collected (from customers). A low number is better for the company as it means high liquidity. A long cash conversion cycle implies low liquidity

The example below for ABC Corp. illustrates the cash conversion cycle. The timeline for various events is illustrated below:

10. Solvency Ratios

Solvency ratios measure a company's ability to meet long-term obligations. In simple terms, it provides information on how much debt the company has taken and if it is profitable enough to pay the interest on debt in the long term. It has to be analyzed within an industry's perspective. Certain industries such as real estate use a higher level of leverage.

Solvency Ratios	Formula	Interpretation
Debt ratios		
Debt-to-assets ratio	$$\dfrac{\text{Total debt}}{\text{Total assets}}$$	Measures the amount of debt in total assets. Higher debt means low solvency and higher risk. A ratio of 0.5 implies 50% of assets are financed with debt.
Debt-to-capital ratio	$$\dfrac{\text{Total debt}}{\text{Total debt } + \text{ Total shareholder's equity}}$$	Measures the amount of debt as a percentage of capital (debt + shareholder's equity).
Debt-to-equity ratio	$$\dfrac{\text{Total debt}}{\text{Total shareholder's equity}}$$	Measures the amount of debt as a percentage of equity.
Financial leverage ratio	$$\dfrac{\text{Average total assets}}{\text{Average total equity}}$$	Measures the amount of assets per unit of equity. A higher value means a company is more leveraged.
Debt-to-EBITDA Ratio	$$\dfrac{\text{Total debt}}{\text{EBITDA}}$$	Estimates how many years it would take to repay total debt based on earnings before income taxes, depreciation and amortization (an approximation of operating cash flow).
Coverage ratios		
Interest coverage ratio (also called 'times interest earned'	$$\dfrac{\text{EBIT}}{\text{Interest payments}}$$	Measures the company's ability to make interest payments (how many times the company can make interest payments with its EBIT). Unlike the other solvency ratios, **a higher value for this ratio is better** as it means stronger solvency.
Fixed charge coverage ratio	$$\dfrac{\text{EBIT } + \text{ lease payments}}{\text{Interest payments } + \text{ lease payments}}$$	Measures the ability of a company to pay interest on debt.

		Here, lease payments are added to EBIT as they are an obligation like interest payments. Like the interest coverage ratio, a higher value for this ratio implies stronger solvency. This ratio is a more meaningful measure for companies that lease a large portion of their assets. For example, airline companies.

Note that there are two categories of solvency ratios: debt (or leverage) ratios and coverage ratios.

In general, a high debt (or leverage) ratio implies a high level of debt, high risk, and low solvency. With coverage ratios, a high number is good because this indicates high income relative to interest payments.

11. Profitability Ratios

Profitability ratio	Formula	Interpretation
Return on Sales		
Gross profit margin	$\dfrac{\text{Gross profit}}{\text{Revenue}}$	A higher value means higher pricing and lower costs.
Operating profit margin	$\dfrac{\text{Operating income}}{\text{Revenue}}$	Operating profit = gross profit - operating costs. A good sign if operating profit margin grows at a faster rate than gross profit margin.
Pretax margin	$\dfrac{\text{EBT}}{\text{Revenue}}$	EBT = operating profit - interest related expenses. Needs further analysis if pretax income increases only because of non-operating income.
Net profit margin	$\dfrac{\text{Net profit}}{\text{Revenue}}$	Net profit = revenue – all expenses.
Return on Investment		

Operating ROA	$$\frac{\text{Operating income}}{\text{Average total assets}}$$	For return, either net income or operating income (EBIT) can be used.
Return on assets (ROA)	$$\frac{\text{Net income}}{\text{Average total assets}}$$	For return, either net income or operating income (EBIT) can be used.
Return on total capital	$$\frac{\text{EBIT}}{\text{Average short term and long term debt } + \text{equity}}$$	Like operating ROA, EBIT is used. Measures return on capital before deducting interest.
Return on equity (ROE)	$$\frac{\text{Net income}}{\text{Average total equity}}$$	A very important measure of return earned on equity capital. Unlike return on common equity, it includes minority and preferred equity.
Return on common equity	$$\frac{\text{Net income } - \text{ preferred dividend}}{\text{Average common equity}}$$	Money available to common shareholders.

12 & 13. Integrated Financial Ratio Analysis

DuPont Analysis: The Decomposition of ROE

DuPont analysis decomposes a firm's ROE to better analyze a firm's performance.

Start with ROE

$$ROE = \left(\frac{\text{net income}}{\text{equity}}\right)$$

The traditional DuPont equation is:

$$ROE = \left(\frac{\text{net income}}{\text{sales}}\right)\left(\frac{\text{sales}}{\text{assets}}\right)\left(\frac{\text{assets}}{\text{equity}}\right)$$

$$ROE = (\text{net profit margin})(\text{asset turnover})(\text{leverage ratio})$$

The extended DuPont equation is:

$$ROE = \left(\frac{\text{net income}}{\text{EBT}}\right)\left(\frac{\text{EBT}}{\text{EBIT}}\right)\left(\frac{\text{EBIT}}{\text{revenue}}\right)\left(\frac{\text{revenue}}{\text{total assets}}\right)\left(\frac{\text{total assets}}{\text{total equity}}\right)$$

$$ROE = (\text{tax burden})(\text{interest burden})(\text{EBIT margin})(\text{asset turnover})(\text{financial leverage})$$

Example

The following data is available for a company:

	2010	**2011**	**2012**

ROE	19%	20%	22%
ROA	8.1%	8%	7.9%
Total asset turnover	2	2	2.1

Based only on the information above, the most appropriate conclusion is that over the period 2010 to 2012, the company's:

A. Net profit margin and financial leverage have decreased.

B. Net profit margin and financial leverage have increased.

C. Net profit margin has decreased but its financial leverage has increased.

Solution:

A quick glance at the data says profitability is going up and asset turnover has slightly increased from 2010 to 2012. ROA is going down from the second year.

First, break down ROE into: $\frac{\text{Net income}}{\text{Assets}}$ x $\frac{\text{Assets}}{\text{Equity}}$ = ROA x Leverage.

ROE is going up (first row). Since ROA is going down, leverage must increase for ROE to increase. So A is incorrect.

Next, to determine if net profit margin increased or decreased, break down ROA into $\frac{\text{Net income}}{\text{Sales}}$ x $\left(\frac{\text{Sales}}{\text{Assets}}\right)$. Since $\left(\frac{\text{Sales}}{\text{Assets}}\right)$ or asset turnover is increasing, net profit margin has to decrease for return on assets to decrease. So, the correct answer is C.

14. Equity Analysis and Valuation Ratios

One of the most common applications of financial analysis is that of selecting stocks. An equity analyst uses various tools (such as valuation ratios) before recommending a security to be included in an equity portfolio. The valuation process consists of the following steps:
- Understanding the company's business and existing financial profile.
- Forecasting the company's performance, such as revenue projections.
- Selecting the appropriate valuation model.
- Converting forecasts to a valuation.
- Making the investment decision to buy or not to buy.

This section, in particular, focuses on the ratios used to value equity. Research has shown that ratios are useful in forecasting earnings and stock returns. Note that this material is covered in more detail in the equity segment of the curriculum.

14.1 Valuation Ratios

Valuation ratios aid in making investment decisions. They help us determine if a stock is undervalued or overvalued.

Valuation Ratio	Formula	Interpretation

P/E	$\dfrac{\text{Price per share}}{\text{Earnings per share}}$	Most often used valuation measure. Prone to earnings manipulation. Non-recurring earnings may distort the ratio.
P/CF	$\dfrac{\text{Price per share}}{\text{Cash flow per share}}$	Less prone to manipulation than P/E.
P/S	$\dfrac{\text{Price per share}}{\text{Sales per share}}$	Used when net income is not positive.
P/BV	$\dfrac{\text{Price per share}}{\text{Book value per share}}$	An indicator of what the market perceives. A value greater than 1 means future rate of return is higher than required rate of return.

Per-share quantities	
Basic EPS	$\dfrac{\text{Net income minus preferred dividends}}{\text{Weighted average number of ordinary shares outstanding}}$
Diluted EPS	$\dfrac{\text{(Adjusted income)}}{\text{Weighted average number of ordinary shares outstanding}}$
Cash flow per share	$\dfrac{\text{Cash flow from operations}}{\text{Weighted average number of shares outstanding}}$
EBITDA per share	$\dfrac{\text{EBITDA}}{\text{Weighted average number of shares outstanding}}$
Dividends per share	$\dfrac{\text{Common declared dividends}}{\text{Weighted average number of shares outstanding}}$

Dividend-related ratios

Dividend-related formulae		
Dividend Ratios	**Formula**	**Interpretation**
Dividend payout ratio	$\dfrac{\text{Dividend}}{\text{Earnings}}$	Measures the percentage of earnings a company pays out as dividends to equity shareholders.
Retention rate	1 - payout rate	Measures the percentage of earnings a company retains.
Sustainable growth rate	Retention rate x ROE	Measures how much growth a company is able to finance from its internally generated funds. A higher retention rate and ROE result in higher sustainable growth rate.

15. Industry-Specific Financial Ratios

Ratios serve as indicators of some aspect of a company's performance and value. Aspects of performance that are important in one industry may be irrelevant in another. These differences are reflected through industry-specific ratios. For example, companies in the retail industry may report same-store sales changes because in the retail industry it is important to distinguish between growth that results from opening new stores and growth that results from generating more sales at existing stores.

Other examples of industry specific ratios include:
- Service companies: revenue per employee, net income per employee
- Hotels: Average daily rate, occupancy rate

Instructor's Note: 'Section 16: Research on Financial Ratios in Credit and Equity Analysis' is not testable and has not been covered.

17. Credit Analysis

Credit risk is the risk that the borrower will default on a payment when it is due. For example, if you are a bondholder, credit risk is the risk that the bond issuer will not pay you the interest on time. Credit analysis is the evaluation of this credit risk. Just as ratio analysis is useful in valuing equity, it can also be applied to analyze the creditworthiness of a borrower.

Credit ratings are based on a combination of qualitative and quantitative factors. Qualitative factors include an industry's growth prospects, volatility, technological change, competitive environment, operational effectiveness, strategy, governance, financial policies, risk management practices, and risk tolerance. Quantitative factors include profitability, leverage, cash flow adequacy, and liquidity.

Some of the ratios commonly used in credit analysis are listed below:

Credit Analysis Ratio	Formula	Interpretation
EBITDA interest coverage	$\dfrac{\text{EBITDA}}{\text{Gross Interest } *}$ *Gross interest include non-cash interest on conventional debt instruments	A high value implies good credit quality.
FFO (Funds from operations) to debt	FFO / Total debt	A high value implies good credit quality.
Free operating cash flow to debt	CFO (adjusted) minus capital expenditures / Total debt	A high value implies good credit quality.

EBIT margin	EBIT / Total revenue	A high value implies good credit quality.
EBITDA margin	EBITDA / Total revenue	A high value implies good credit quality.
Debt to EBITDA	$\dfrac{\text{Total debt}}{\text{EBITDA}}$	Low debt/EBITDA implies good credit quality.
Return on capital	EBIT / Average beginning-of-year and end-of-year capital	A high value implies good credit quality.

18. Business and Geographic Segments

A business or geographic segment is a portion of a company that has risk and return characteristics distinct from the rest of the company and accounts for more than 10% of the company's sales or assets. Companies are required to report some items for significant segments separately.

Ratios can be computed for business segments to evaluate how units within a business are performing. Some of the key segment ratios are listed below:

Ratio	Formula	Measures
Segment margin	$\dfrac{\text{Segment profit}}{\text{Segment revenue}}$	Operating profitability relative to revenue.
Segment turnover	$\dfrac{\text{Segment revenue}}{\text{Segment assets}}$	Overall efficiency of the segment.
Segment ROA	$\dfrac{\text{Segment profit}}{\text{Segment assets}}$	Operating profitability relative to assets.
Segment debt ratio	$\dfrac{\text{Segment liabilities}}{\text{Segment assets}}$	Solvency.

19. Model Building and Forecasting

Analysts use several methods to forecast future performance. One commonly used method is to project sales and to combine the forecasted sales numbers with expected values for key ratios. For example, by using sales numbers and gross profit margin, one can determine cost of goods sold and gross profit. This method is particularly useful for mature companies with stable margins.

Besides ratio analysis, techniques such as sensitivity analysis, scenario analysis, and simulations are often used as part of the forecasting process.
- Sensitivity analysis shows a range of possible outcomes as specific assumptions or input variables are changed.

- With scenario analysis, a number of different scenarios are defined and outcomes are estimated for each outcome.
- Simulations involve the use of computer models and input variables which are based on a pre-defined probability distribution.

Summary

LO.a: Describe tools and techniques used in financial analysis, including their uses and limitations.

A ratio is an indicator of some aspect of a company's performance like profitability or inventory management.

Uses of ratio analysis	Limitations of ratio analysis
• Evaluate operational efficiency and financial flexibility. • Compare company performance relative to industry and peer companies. • Compare across companies irrespective of size and currency.	• An analyst must exercise judgment when interpreting ratios. • Use of alternate accounting methods may require adjustments before the ratios are comparable. • Companies may have divisions operating in many different industries. This can make it difficult to find comparable ratios.

Common-size financial statements are used to compare the performance of different companies within an industry or a company's performance over time. The vertical common-size balance sheet helps in cross-sectional and time-series analysis. An analysis of horizontal common-size balance sheets highlights structural changes that have occurred in a business.

A graph is a pictorial representation of the analysis done, be it ratio analysis or trend analysis. It helps in quick comparison of financial performance and structure over time.

Regression analysis is a statistical method of analyzing relationships (correlations) between variables.

LO.b: Identify, calculate, and interpret activity, liquidity, solvency, profitability, and valuation ratios.

Activity ratios measure the efficiency of a company's operations, such as collection of receivables or management of inventory. They include inventory turnover, days of inventory on hand, receivables turnover, days of sales outstanding, payables turnover, number of days of payables, working capital turnover, fixed asset turnover, and total asset turnover.

Liquidity ratios measure the ability of a company to meet short-term obligations. They include the current ratio, quick ratio, cash ratio, and defensive interval ratio.

Solvency ratios measure the ability of a company to meet long-term obligations. They include debt-to-assets ratio, debt-to-capital ratio, debt-to-equity ratio, financial leverage ratio, debt-to-EBITDA ratio, interest coverage ratio and fixed charge coverage ratio.

Profitability ratios measure the ability of a company to generate profits from revenue and assets. They include gross profit margin, operating profit margin, pretax margin, net profit margin, ROA, return on total capital, ROE, and return on common equity.

Valuation ratios express the relation between the market value of a company or its equity. They include EPS, P/E, P/B, and P/CF.

LO.c: Describe relationships among ratios and evaluate a company using ratio analysis.

To evaluate the overall position and performance of a company, a single ratio or a single category of ratios is not examined in isolation. The information from one ratio category can be helpful in answering questions raised by another category and the most accurate overall picture comes from integrating information from all sources.

LO.d: Demonstrate the application of DuPont analysis of return on equity, and calculate and interpret effects of changes in its components.

The traditional DuPont equation is:

$$\text{ROE} = \left(\frac{\text{net income}}{\text{sales}}\right)\left(\frac{\text{sales}}{\text{assets}}\right)\left(\frac{\text{assets}}{\text{equity}}\right)$$

The extended DuPont equation is:

$$\text{ROE} = \left(\frac{\text{net income}}{\text{EBT}}\right)\left(\frac{\text{EBT}}{\text{EBIT}}\right)\left(\frac{\text{EBIT}}{\text{revenue}}\right)\left(\frac{\text{revenue}}{\text{total assets}}\right)\left(\frac{\text{total assets}}{\text{total equity}}\right)$$

LO.e: Calculate and interpret ratios used in equity analysis and credit analysis.

Ratios used in equity analysis include:
- P/E
- P/CF
- P/S
- P/BV
- Basic and diluted EPS

These ratios help to determine if a stock is overvalued or undervalued.

Credit analysis is the evaluation of this credit quality. Credit ratings are based on a combination of qualitative and quantitative factors.

Ratios used in credit analysis include:
- EBITDA Interest coverage ratios
- FFO (Funds from operations) to debt
- Free operating cash flow to debt
- EBIT margin
- EBITDA margin
- Debt to EBITDA
- Return on capital

High coverage ratios would indicate good credit quality.

LO.f: Explain the requirements for segment reporting, and calculate and interpret segment ratios.

A business or geographic segment is a portion of a company that has risk and return characteristics distinct from the rest of the company and accounts for more than 10% of the company's sales or assets. Companies are required to report some items for significant segments separately.

Ratios can be computed for business segments to evaluate how units within a business are performing.

LO.g: Describe how ratio analysis and other techniques can be used to model and forecast earnings.

Analysts often use common-size analysis and ratio analysis to prepare pro forma financial statements. They forecast future sales and combine the forecasted sales numbers with expected value for key ratios.

Practice Questions

1. An analyst compares a company's financial results to other peer companies for the same time period. He is *most likely* performing:
   A. technical analysis.
   B. time-series analysis.
   C. cross-sectional analysis.

2. Which of the following is *least likely* a limitation of ratio analysis?
   A. Ratios are not useful when viewed in isolation.
   B. It is difficult to obtain data on comparable companies.
   C. It is difficult to determine the range of acceptable values for a ratio.

3. Annie Pinto wants to compare a specific metric for company A over the years starting from 2008 till 2018. Which of the following kinds of analyses is Pinto *most likely* to conduct?
   A. A trend analysis.
   B. A longitudinal analysis.
   C. A cross sectional analysis.

4. Company ABC's purchases were $200,000 during the year. Its balance sheet shows an average accounts payable balance of $10,000 and an average accounts receivable balance of $20,000. ABC's payables payment period is *closest* to:
   A. 18 days.
   B. 24 days.
   C. 36 days.

5. Company ABC's sales and gross profit during the year were $200,000 and $60,000 respectively. Its balance sheet shows an average inventory balance of $28,000. ABC's days of inventory on hand is *closest* to:
   A. 35 days.
   B. 53 days.
   C. 73 days.

6. Company ABC's payable turnover is 8 times, the receivable turnover is 9 times and the inventory turnover is 6 times. ABC's cash conversion cycle is *closest* to:
   A. 38 days
   B. 56 days.
   C. 74 days.

7. Company ABC's sales and COGS during the year were $100,000 and $40,000 respectively. Its balance sheet shows total assets of $70,000 and an average inventory balance of $10,000. ABC's total asset turnover and gross margin are *closest* to:

	Total asset turnover	Gross margin
A.	1.43	60%
B.	1.58	40%
C.	1.65	50%

8. In order to examine a company's ability to meet its short-term obligation, an analyst would *most likely* examine the:
    A. Current ratio.
    B. Debt-to-equity ratio.
    C. Gross profit margin.

9. Company ABC has a net profit margin of 10%, a total asset turnover of 2 times, and a financial leverage multiplier of 1.5 times. ABC's return on equity is *closest* to:
    A. 10%
    B. 24%
    C. 30%

10. An analyst has gathered the following information about a company:
    *   Operating profit margin = 12%
    *   Average tax rate = 30%
    *   Asset turnover ratio = 2 times
    *   Financial leverage multiplier = 1.5 times
    *   Interest burden = 0.6 times
    The company's ROE is *closest* to:
    A. 12%.
    B. 15%.
    C. 18%.

11. Which of the following will *least likely* result in an increase in a company's sustainable growth rate?
    A. Higher tax burden ratio.
    B. Higher interest burden ratio.
    C. Higher dividend payout ratio.

12. A decrease in which of the following ratios would be favorable for a creditor?
    A. Interest coverage ratio.
    B. Debt-to-total assets.
    C. Return on assets.

13. Which of the following is *most likely* a valuation ratio?
    A. Debt to EBITDA.
    B. Dividends per share.
    C. Dividend payout ratio.

14. The retention ratio is *least likely*:
    A. 1 – payout ratio.
    B. Earnings * Sustainable growth rate.
    C. ROE * Sustainable growth rate.

15. At the individual company level, the credit ratings *least likely* reflect:
    A. Company's cash flow adequacy.
    B. Company's valuation ratios.
    C. Company's leverage.

Solutions

1. C is correct. Cross-sectional analysis is the comparison of companies with each other for the same time period. Technical analysis uses price and volume data as the basis for investment decisions. Time-series analysis is the comparison of financial data across different time periods.

2. B is correct. Company and industry data is easily available through various public and private sources. Options A and C are limitations of ratio analysis.

3. A is correct. Trend analysis or time-series analysis provides information on historical performance and growth, by observing metrics of one company over multiple periods. The cross-sectional analysis (also called relative analysis) allows for comparing a specific metric for a company with the same metric for another company for a single time period. Longitudinal data represent the observations on characteristic(s) of the same observational unit through time.

4. A is correct. Payables turnover = purchases/ average payables = $200,000/ $10,000 = 20
Payables payment period = 365/20 = 18.25 days.

5. C is correct. COGS = $200,000 - $60,000 = $140,000.
Inventory turnover = COGS / average inventory = $140,000/$28,000 = 5
Days of inventory on hand = 365/ inventory turnover = 365/5 = 73 days.

6. B is correct. Cash conversion cycle = Days of sales outstanding + Days of inventory on hand – Number of days of payable = 365/9 + 365/6 – 356/8 = 55.76 days

7. A is correct.
Total asset turnover = Sales / Total assets = $100,000 / $70,000 = 1.43 times.
Gross profit = Sales – COGS = $100,000 - $40,000 = $60,000.
Gross margin = Gross profit / Sales = $60,000 / $100,000 = 60%.

8. A is correct. Liquidity ratios like the current ratio indicate the firm's ability to meet its short-term obligations.

9. C is correct.
$$\text{Return on equity} = \frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{assets}} \times \frac{\text{Assets}}{\text{Equity}}$$
= 0.10 x 2 x 1.5 = 0.3 = 30%

10. B is correct.

$$ROE = \frac{\text{Net income}}{\text{EBT}} \times \frac{\text{EBT}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{Revenue}} \times \frac{\text{Revenue}}{\text{average assets}} \times \frac{\text{Average assets}}{\text{Equity}}$$

Tax burden = 1-tax rate = 1 – 0.3 = 0.7
ROE = 0.7 x 0.6 x 0.12 x 2 x 1.5 = 0.1512 = 15%

11. C is correct.
    Sustainable growth rate = Retention ratio × ROE.
    A higher dividend payout ratio means a lower retention ratio.
    ROE = Tax burden × Interest burden × EBIT margin × Asset turnover × Leverage.
    Higher tax burden and higher interest burden will increase ROE and hence increase the sustainable growth rate.

12. B is correct. In general, a creditor would consider a decrease in debt to total assets as favorable. A high debt-to-total assets ratio increases the risk of default. A decrease in either interest coverage or return on assets is likely to be considered unfavorable.

13. B is correct. Dividends per share is a valuation ratio. Debt to EBITDA is a credit analysis ratio while dividend payout is dividend divided by earnings – a dividend related ratio.

14. A is correct. Retention ratio is 1 – payout ratio or ROE * Sustainable growth rate.

15. B is correct. Credit ratings' quantitative factors include profitability, leverage, cash flow adequacy, and liquidity. Valuation ratios are used in equity analysis.