ACCT 101, Session 9: Financial Statement Analysis

Dr. Richard M. Crowley rcrowley@smu.edu.sg

https://rmc.link/

Front matter



Learning objectives



analysis 2. Calculate and interpret financial ratios

1. Learn about financial statement



Financial statement analysis



What matters?

1. The business environment

- Economy health
- Other countries (particularly for multinational firms)
- Industry demand
- Resource scarcity or supplier concentration
- Consumer concentration
- 2. Historical financials
 - Financial statements and notes
 - Competitors statements



What matters?

- 3. Historical non-financials
 - Governance
 - Risk disclosures
 - Audit report
 - Shareholders
 - supplier relationships



Predicting firm value

1. Trend analysis (a.k.a. Horizontal analysis)

- Compare dollar and percent changes across years
- 2. Common size financial statements (a.k.a. Vertical analysis)
 - Compare financials across years or firms
 - A subset of ratio analysis
- 3. Ratio analysis
- 4. Analytics

Only ratio analysis is on the final – we'll cover the others briefly.



Trend analysis



What is it?

- Comparing different years or quarters of data to see the *trend* in measures.
- Examples:
 - Revenue grew by 3% this year
 - Net income grew by 4% this quarter
 - Quarterly revenue decreased 2% year over year

Examples

• How extreme weather worries are driving revenue growth at data giant MSCI

But the 13 per cent growth rate for ESG and climate tools outstripped MSCI's overall organic *increase in operating revenues* in the second quarter, which was 10 per cent. — FT

• Grab's revenue grows 17 percent year-on-year in second quarter

C Singapore-based superapp Grab announced Thursday that its *revenue* grew 17 percent year-over-year to \$664 million in the second quarter of 2024, driven by revenue growth across all segments. - TN Global

How to do it

1. Get 2 financial statements from the same company (typically the income statement) 2. Find the percentage change from the old figures to the new figures

Microso Partial Income S In Millions of	ft Statement f USD			
Year ended June 30,	2017	2016		
Revenue				
Product	51,190	61,502		17% decrease
Service	32,760	23,818		38% increase
Total revenue	89,950	85,320		5.4% increase
Total cost of revenue	34,261	32,780		4.5% increase
Gross profit	55,689	52,540		6.0% increase
Research and development	13,037	11,988		8.8% increase
Sales and marketing	15,539	14,697	\Rightarrow	5.7% increase
Net income	21,204	16,798		26% increase





Common-size financial statements



What is it?

- Standardizing figures in a financial statement by dividing by another figure.
- Allows for comparing financial statements across companies
- Ex.:
 - Divide an income statement by revenue
 - $\circ \frac{Gross \ profit}{Revenue} = Gross \ Margin$ $\circ \frac{Net \ income}{Revenue} = Profit \ Margin$
 - Divide financial statements by total assets

Examples

- Tesla profit margin worst in five years as price cuts, incentives weigh on bottom line
 - **C** Tesla on July 23 reported its lowest *profit margin* in more than five years and missed Wall Street earnings targets in the second quarter, as the electric vehicle (EV) maker cut prices to revive demand while it increased spending on artificial intelligence (AI) projects. - Straits Times
- Nike Inc (NKE) Q1 2025 Earnings Call Transcript Highlights: Revenue Decline Amidst **Gross Margin**

Nike Inc (NYSE:NKE) reported *gross margin* expansion of 120 basis points to 45.4%, driven by lower product costs and strategic pricing actions. — Yahoo! Finance

How to do it

1. Get a financial statement

2. Divide every number by the same amount (sales, total assets, etc.) to get the percent (of sales, of assets, etc.)

E F							
	Microsoft Partial Income Statem In Millions of USD	ent		Percent of sales		Apple Partial Income Statem In Millions of USD	nent
	Year ended June 30,	2017				Year ended September 30,	2017
	Total revenue	89,950	\Rightarrow	100%		Total revenue	229,234
	Total cost of revenue	34,261	\rightarrow	38.1%		Total cost of revenue	141,048
	Gross profit	55,689	\Rightarrow	61.9%		Gross profit	88,186
2	Research and development	13,037	\Rightarrow	14.5%		Research and development	11,581
	Sales and marketing	20,326	\Rightarrow	22.6%		Sales and marketing	15,261
	Net income	21,204		23.6%		Net income	48,351
L							

We can compare accross companies or years





Balance sheet ratios



What is ratio analysis?

• Using various ratios of numbers from financial statements to better understand companies

All examples use the following data:

Microsoft			
Partial Income Statement In millions of USD			
Year ended June 30.	2017	2016	
Revenue			
Product	51 100	61 502	
	01,100	01,002	
Service	32,760	23,818	
Total revenue	89,950	85,320	
Total cost of revenue (COGS)	34,261	32,780	
Gross profit	55,689	52,540	
Research and development	13,037	11,988	
Sales and marketing	15,539	14,697	
	1		
Operating income	22,326	20,182	
Interest expense	2,222	1,243	
Net income	21,204	16,798	

Micros Partial Balan In millions o	oft ce Sheet of USD		MS (price in dividends
Year ended June 30,	2017	2016	June 30,
Current assets			Price
Cash	7,663	6,510	Shares
Short term investments	125,318	106,730	Dividend paid
A/R	19,792	18,277	
Inventory	2,181	2,251	
Total current assets	159,851	139,660	
Total assets	241,086	193,468	
Current liabilities			
A/P	7,390	6,898	
Total current liabilities	64,527	59,357	
Total liabilities	168.692	121,471	
	,	,	
Total equity	72,394	71,997	

SFT Stock Quotes USD, shares in millions. paid in millions of USD)

2017	2016
68.93	51.17
7,708	7,808
12,040	11,329

Caveats

1. There are a few differences between the ratios in these slides and in the book. These differences are due to simplifications I have made – you can use these ratios on the final instead of the book's ratios without penalty.

2. Some ratios have many definitions. If you look online, you may find other definitions for some of these ratios. Don't use those on the final.

Inventory turnover

COGS

$\frac{1}{2}(Inventory_T + Inventory_{T-1})$

- How many times per year a company sells its inventory on hand
- A similar measure is *Inventory resident period*
 - A.k.a. Number of days' sales in inventory
 - Calculated as <u>365</u> <u>Inventory turnover</u>
 - The number of days it take to sell the company's inventory

Microsoft's 2017 inv. turnover: $rac{34,261}{rac{1}{2}(2,181+2,251)}=15.46$

Microsoft's 2017 inv. period: $rac{365}{15.46}=23.6\ days$



Accounts receivable turnover

Revenue

$rac{1}{2}(A/R_T+A/R_{T-1})$

- How many times per year a company collects its A/R on hand
- A similar measure is *Receivable collection period*
 - A.k.a. Number of days' sales in receivables
 - Calculated as <u>Accounts receivable turnover</u>
 - The number of days it take to collect the company's A/R

Microsoft's 2017 A/R turnover: $\frac{89,950}{\frac{1}{2}(19,792+18,277)} = 4.73$

Microsoft's 2017 A/R period: $\frac{365}{4.73} = 77.2 \ days$



Payable turnover

How many times per year a company pays its A/P it owes

COGS

 $\frac{1}{2}(A/P_T + A/P_{T-1})$

- A similar measure is *Payable outstanding period*
 - Calculated as <u>365</u> <u>Payable turnover</u>
 - The number of days it take to pay the company's A/P

Microsoft's 2017 A/P turnover: $\frac{34,261}{\frac{1}{2}(7,390+6,898)} = 4.80$

Microsoft's 2017 A/P period: $\frac{365}{4.80} = 76.1 \ days$



Cash conversion cycle



Receivable collection period+*Inventory resident period*-*Payable outstanding period*

- Measures how long it takes from paying payables to receiving cash for a sale
- Can calculate from turnover ratios or periods



Microsoft's 2017 cash conversion cycle: $23.6 + 77.2 - 76.1 = 24.7 \ days$

365



Current ratio

 $Current\ assets$

Current liabilities

- Measures a company's ability to pay current liabilities
- This should usually be >2

Microsoft's 2017 current ratio: $rac{159,851}{64,527}=2.48$



Quick ratio

 $Cash+Short\ term\ investments+A/R$

$Current\ liabilities$

- A.k.a. acid-test ratio
- Measures a company's ability to pay current liabilities
 - Only factors in liquid current assets
- This should be > 1





Debt to equity ratio

 $Total\ liabilities$

Total equity

- Measures a company's leverage
 - Leverage = how much the company is financed by debt
- Higher = more leverage = more debt financing

Microsoft's 2017 debt to equity ratio: $\frac{168,692}{72394} = 2.33$



Times-interest-earned ratio

 $Income\ from\ operations$

 $Interest\ expense$

- Measures a company's ability to cover interest payments
- Higher is better, < 1 should cause some worry

Microsoft's 2017 times-interest-earned ratio: $\frac{22,326}{2,222} = 10.05$



Practice

Calculate the following ratios for Microsoft in 2016

- Payable outstanding period
- Quick ratio
- Debt to equity ratio
- Times-interest-earned ratio

Extra info: Microsoft's A/P in 2015 was \$6,591M



Solution

- Payable payment period ($76.1 \ days$ in 2017)
 - $\bullet \ 365 / \frac{32,780}{\frac{1}{2}(6,898+6,591)} = 75.1 \ days$
- Quick ratio (2.37 in 2017)
 - $\bullet \ \frac{6,510+106,730+18,277}{59,357} = 2.22$
- Debt to equity ratio (70.0% in 2017)
 - $\frac{121,471}{71997} = 1.69$
- Times-interest-earned ratio (10.5 in 2017)
 - $\bullet \ \frac{20,182}{1,243} = 16.2$



Income statement ratios



Profit Margin

Profit

Revenue

- Gross profit margin tells you about the company's selling margins
- Net profit margin tells you about its overall profitability

Microsoft's 2017 gross profit margin: $\frac{55,689}{89,950} = 61.9\%$

Microsoft's 2017 net profit margin: $rac{21,204}{89,950}=23.6\%$



Return on assets (ROA)

 $Net\ income$

 $\frac{1}{2}(Assets_T + Assets_{T-1})$

- Measures overall profitability based on the company's size
- Very common measure in practice
- Higher is better





Return on equity (ROE)

 $Net\ income$

$\frac{1}{2}(Equity_T + Equity_{T-1})$

- Measures overall profitability based on the company's size
 Stockholder focussed
- Very common measure in practice
- Higher is better

Microsoft's 2017 ROE: $\frac{21,204}{\frac{1}{2}(72,394+71,997))} = 29.4\%$



Practice

Calculate the following ratios for Microsoft in 2016

- Net profit margin
- Return on assets (ROA)
- Return on equity (ROE)

Extra info: Microsoft's 2015 total assets was \$176,223M and Microsoft's 2015 total equity was \$80,083M



Solution

- Net profit margin (23.6% in 2017)
 - $\bullet \ \frac{16,798}{85,320} = 19.7\%$
- ROA (9.76% in 2017) $\frac{16,798}{\frac{1}{2}(193,468+176,223)} = 9.09\%$
- ROE (29.4% in 2017)16.798

$$\frac{16,798}{\frac{1}{2}(71,997+80,083)} = 22.1\%$$



Equity ratios





Earnings per share (EPS)

 $Net\ income-Dividends\ on\ pref.\ shares$

 $\frac{1}{2}(\#Shares_T + \#Shares_{T-1})$

- Measures the amount of profit tied to each share of stock
- Very common measure in practice
- Assume shares in year T and T-1 are the same if not stated
- Very easily manipulated

Microsoft's 2017 EPS: $rac{21,204-0}{rac{1}{2}(7,708+7,808))} = \$2.73/share$



Price/earnings ratio (P/E ratio)

 $\frac{Stock\ price}{EPS}$

- A measure of if a stock is overpriced
- 6 to 8 is common, 20+ is common for tech firms
 - Higher = overpriced
 - Lower = underpriced
- Very common measure in practice
- Very easily manipulated, since EPS is easily manipulated

Microsoft's 2017 P/E ratio: $\frac{68.93}{2.73} = 25.2$



Practice

Calculate the following ratios for Microsoft in 2016

- EPS
- P/E Ratio

Extra info: Microsoft's 2015 outstanding shares was 8,027M



Solution

- EPS ($\frac{2.73}{share}$ in 2017) • $\frac{16,798-0}{\frac{1}{2}(7,808+8,027)} = \frac{2.12}{share}$
- P/E Ratio (25.2 in 2017)
 - $\frac{51.17}{2.12} = 24.1$



Equations





Balance sheet ratio equations

Inventory turnover = $\frac{COGS}{\frac{1}{2}(Inventory_T + Inventory_{T-1})}$ $m A/R \ turnover = rac{Revenue}{rac{1}{2}(A/R_T + A/R_{T-1})}$ $m A/P \ turnover = rac{COGS}{rac{1}{2}(A/P_T + A/P_{T-1})}$ $Cash conversion cyle = \frac{365}{Inv. \ turnover} + \frac{365}{A/R \ turnover} - \frac{365}{A/P \ turnover}$ $Asset turnover = \frac{Net \ revenue}{\frac{1}{2}(Assets_T + Assets_{T-1})}$ Current ratio = *Current assets/Current liabilities* $\label{eq:Quick ratio} \text{Quick ratio} = \frac{Cash + Short \ term \ investments + A/R}{Current \ liabilities}$ Debt to equity ratio = Total liabilities/Total equity $\text{Times-interest-earned} = \frac{Income \ from \ operations}{-}$ Interest expense





Income statement ratio equations

 $\begin{array}{l} \mbox{Gross (profit) margin} = & \frac{Gross \ profit}{Revenue} \\ \mbox{Net profit margin} = & \frac{Net \ income}{Revenue} \\ \mbox{Return on assets (ROA)} = & \frac{Net \ income}{\frac{1}{2}(Assets_T + Assets_{T-1})} \\ \mbox{Return on equity (ROE)} = & \frac{Net \ income}{\frac{1}{2}(Equity_T + Equity_{T-1})} \end{array}$





Equity ratio equations





 $\varepsilon_{ex} = \frac{dQ_{ex}}{de} \cdot \frac{e}{Q_{ex}}; \ \varepsilon_{in} = \frac{dQ_{im}}{de} \cdot \frac{e}{Q_{im}}.$ $NE(e) = Q_{ex}(e) - eQ_{im}(e),$

E

ROF

 $\beta(a, b) = \int_{a}^{b-1} d\frac{x^{a}}{q} =$

de Qim

 $\frac{i=1}{n-2}$

 $=\frac{x^{2}(1-x)^{b-1}}{a}\Big|_{0}^{1}\frac{b-1}{a}\int_{a}^{1}x^{a}(1-x)^{b-2}dx=$

ANE - Analytics

 $\chi_{L_{u}} = \frac{\sum_{P_0, Q_1}}{\sum_{Q_1}} + \frac{\sum_{P_0, Q_0}}{\sum_{Q_0}} f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx) \qquad G^2(\varepsilon) = \widetilde{S}^2(\varepsilon) = \varepsilon$



Background

This is a quick preview of a module called "Forecasting and Forensic Analytics," part of the Analytics and Forensics majors in SOA

• You don't need to know this for this class, but the techniques covered here are becoming more and more important

Revenue prediction

Predicting ROA for tech companies using prior year data

R1

summary(fit)

Residuals:

Min	1Q	Median	3Q	Max
-4.4421	-0.0238	0.0107	0.0467	0.4378

Coefficients:

	Estimate	Std. Error t	value	Pr(> t)	
(Intercept)	0.004095	0.031227	0.131	0.89569	
ROA_lag	0.469025	0.061576	7.617	6.91e-14	* * *
Revenue lag	0.030639	0.015260	2.008	0.04498	*
Debt lag	0.121253	0.040732	2.977	0.00299	**
	0 000111				++



Code: Revenue prediction

R 1	library(readr)
2	library(dplyr)
3	df <-read.csv("/media/Data/Data/Compustat/Compustat_199301-201703.csv
4	df <- data.frame(df)
5	df_tech <- subset(df,gsector == $45 \& at > 10000$,
6	<pre>select=c("gvkey","datadate","at","ni","lt","revt","</pre>
7	df_tech <- arrange(df_tech, gvkey, datadate)
8	df_tech\$ROA <- df_tech\$ni / df_tech\$at
9	df_tech\$Revenue <- df_tech\$revt / df_tech\$at
10	df_tech\$Debt <- df_tech\$lt / df_tech\$at
11	x <- c("ROA", "Revenue", "Debt") # Columns to lag
12	df_tech <- df_tech %>%
13	group_by(gvkey) %>%
14	<pre>mutate_at(.cols=x, .funs=funs(lag = dplyr::lag(., n=1, default=NA))</pre>
15	<pre>is.na(df_tech) <- sapply(df_tech, is.infinite)</pre>
16	fit <- lm(ROA ~ ROA_lag + Revenue_lag + Debt_lag + factor(gind), data
17	<pre>save(fit, file = "/Data/fit.rda")</pre>
18	<pre>summary(fit)</pre>





Revenue prediction for Microsoft

Predict out Microsoft's 2018 ROA



Year



Code: Revenue prediction for Microsoft

R 1	df_ms <- subset(df,gvkey==12141, select=c("gvkey","datadate","at", "n
2	"revt","gind"))
3	df_ms2 <- data.frame(gvkey=12141, datadate=20170630, at=241086,ni=212
4	lt=168692,revt=89950,gind=451030)
5	df_ms3 <- data.frame(gvkey=12141, datadate=20180630, at=NA,ni=NA,
6	<pre>lt=NA, revt=NA, gind=451030)</pre>
7	df_ms <- rbind(df_ms, df_ms2, df_ms3)
8	df_ms\$ROA <- df_ms\$ni / df_ms\$at
9	df_ms\$Revenue <- df_ms\$revt / df_ms\$at
10	df_ms\$Debt <- df_ms\$lt / df_ms\$at
11	x <- c("ROA", "Revenue", "Debt") # Columns to lag
12	df_ms <- df_ms %>%
13	group_by(gvkey) %>%
14	<pre>mutate_at(.cols=x, .funs=funs(lag = dplyr::lag(., n=1, default=NA))</pre>
15	df_ms\$ROA_predicted <- predict(fit, df_ms)
16	df_ms\$year = floor(df_ms\$datadate/10000)
17	<pre>save(df_ms, file="Data/df_ms.rda")</pre>

<pre>suppressPackageStartupMessages(library(plotly))</pre>
m < -list(l = 60, r = 50, b = 60, t = 100, pad = 4)
<pre>plot_ly(df_ms,x=~year,y=~ROA, name='Actual ROA', type='scatter',</pre>
mode='lines', width = 800 , height = 500) %>%
add_trace(y=~ROA_predicted, name='Predicted ROA') %>%
layout(autosize = F, margin = m,
<pre>xaxis=list(title="Year"), yaxis=list(title="ROA"))</pre>

R

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Fraud detection

- Using 3 components:
 - 1. Topic what companies say in annual reports
 - 2. Style writing style used in annual reports
 - 3. Financials financial ratios

	Clas	Classification %		
	50th	90th	95th	99th
topic	72.54	18.60	11.25	0.097
F-score	71.16	23.86	14.04	0.141
Style	60.21	11.95	6.50	0.085
topic and F-score	74.07	32.07	17.24	0.192
topic and Style	74.47	19.40	11.27	0.123
<i>F</i> -score and Style	73.98	23.73	14.66	0.168
topic, F-score, and Style	75.09	31.50	21.44	0.176

Classification Performance of topic for AAERs and Irregularity Restatements

• Brown, Crowley, & Elliott (2020, Journal of Accounting Research)



95%

Text classification of what we cover in ACCT 101

- This shows the output of a simple machine learning model trained on individual slides from our course
- Its goal is to summarize the content by grouping related words together





End matter



Wrap up

- For next week
 - 1. Do Quiz 2 on eLearn!
 - 2. Recap the reading for this week
 - 3. Read the pages for next week
 - Cash flows (Chapter 11)
 - 4. Practice on eLearn
 - Practice on Financial ratios
 - Automatic feedback provided
- Survey on the class session at rmc.link/101survey2



Packages used for these slides

- kableExtra
- knitr
- revealjs

