

Automated Decision Making in Business and Economics

Financial Modeling and Valuation

Pro forma statements

The first step in valuation typically consists in projecting **income statements** and **balance sheets** in the near future.

We need assumptions on how the income statement and the balance sheets will evolve.

The assumptions are typically **calibrated** looking at past reported information.

Pro forma statements are thus forecasts of the future financial performance of the company.

Income Statement

A proto-typical income statement (amounts in k\$).

Income statement is a **flow** variable.

REVENUES (FROM SALES)	1,000
COST OF GOODS SOLD	(500)
DEPRECIATION	(100)
OPERATING INCOME	400
INTEREST EXPENSE	(32)
INTEREST EARNED	6
EARNINGS BEFORE TAXES	374
TAXES	(150)
NET EARNINGS	225
DIVIDENDS	(90)
RETAINED EARNINGS	135

Reported Balance Sheet

Balance sheet is a **stock** variable.

Assets

CASH AND MARKETABLE SECURITIES	80
CURRENT ASSETS	150
FIXED ASSETS (PPE)	
AT COST	1,070
ACCUMULATED DEPRECIATION	(300)
NET FIXED ASSETS	770
TOTAL ASSETS	1,000

Liabilities and Equity

CURRENT LIABILITIES	80
LONG TERM DEBT	320
STOCK	450
ACCUMULATED RETAINED EARNINGS	150
STOCKHOLDERS' EQUITY	600
TOTAL LIABILITIES AND EQUITY	1,000

The percentage of sales model

In this model, we start from an assumption on the growth rate in revenues from sales. **Sales are considered the key driver.**

We then assume that other income statement and balance sheet items are a fixed percentage of the sales.

Figures are extrapolated from past information. Sensible discretion is needed.

Example:

Forecasted annual sales growth	10%
COGS/Sales	50%
Depreciation/Gross PPE	10%
Net fixed assets/Sales	77%
Interest rate on debt	10%
Interest rate earned	8%
Tax rate	40%
Debt	no change
Dividends	no change

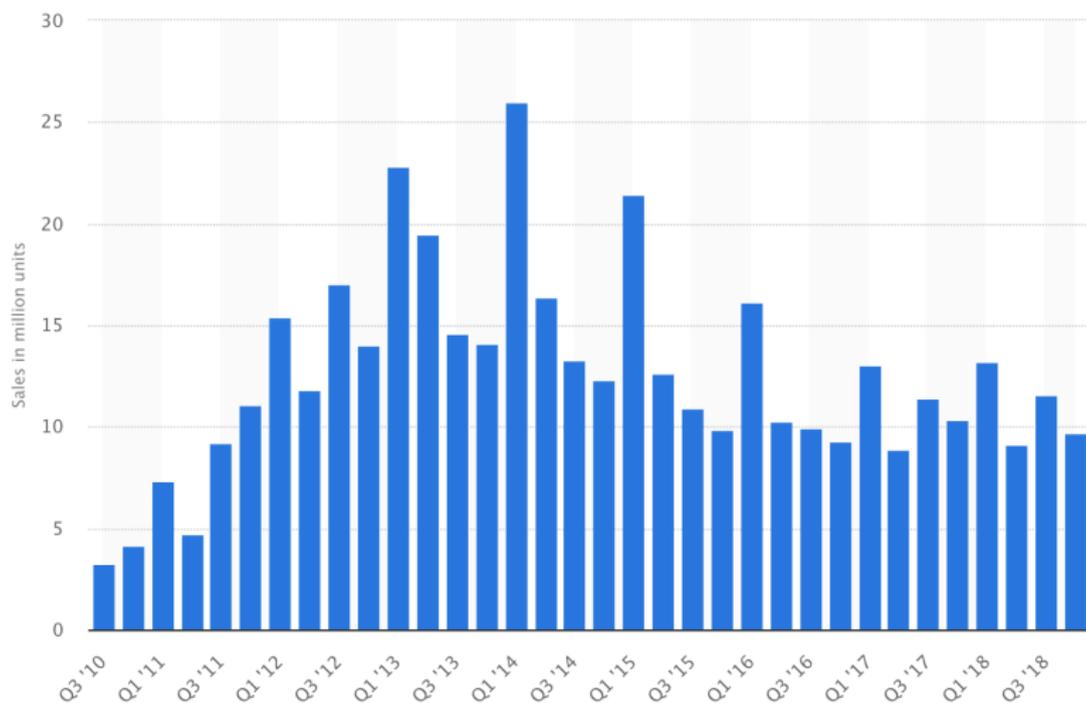
Forecasting growth rates

The most important variable is the **growth rate of revenues from sales**.

- ▶ It makes sense to estimate it using the past growth rates. It also makes sense to consider the industry outlook.
- ▶ Mature companies likely display a constant growth rate.
- ▶ Rapidly expanding companies will display large growth rates in the recent past. You can project them forward, but you need to consider that the growth rate needs to slow down as the company becomes more mature.

The growth cycle: an example

Global Apple iPad sales from 3rd fiscal quarter of 2010 to 4th fiscal quarter of 2018 (in million units)



The circularity problem

When projecting the income statement and the balance sheet in the future, we have the problem that they depend on each other.

The income statement determines the balance sheet.

The balance sheet affects the income statement via depreciation and interest expenses.

We can solve this problem using numerical techniques (iteration).

Plugs

The problem is solved using a **plug**.

The plug is an item in the balance sheet that is used to make total assets equal to total liabilities and equity at all time.

We can use an asset plug (cash) or a liability plug (notes payable) or both.

Negative cash as a result of a plug means we need more debt to finance the assets.

Negative liability as a result of a plug means we have additional cash.

EXERCISE 1: DEBT PLUG

Solve for the debt plug using the following assumptions:

Current Assets/Sales 20%

Fixed Assets/Sales 50%

Current Liabilities/Sales 15%

EQUITY \$40,000

DEBT Plug

SALES \$100,000

 Debt Plug

We are given the following empty balance sheet.

	A	B	C	D	E	F	G
1	<u>Introduction to Pro Forma Statements</u>						
2							
3	Assumptions				The balance sheet		
4					Current Assets		
5	Current Assets/Sales				Fixed Assets		
6	Fixed Assets/Sales				Total Assets		
7	Current Liabilities/Sales						
8	EQUITY				Current Liabilities		
9	DEBT				Debt		
10					Equity		
11	SALES				Total Liabilities+Equity		

Asset = anything that you own.

- **Liquid assets:** Cash and cash equivalent
- **Tangible assets:** real estate like buildings and land; and business equipment such as machinery and vehicles;
- **Intangible assets:** Patents, investments like stocks and bonds;
- **Noncurrent assets:** accounts receivable, futures.

Liability = anything that you owe.

- **Current liabilities:** Anything due within a year including accounts payable, interest payable, short-term business loans and taxes payable;
- **Long-term liabilities:** Anything due in more than a year, including bonds payable, notes payable, deferred tax and mortgages. These might also appear on your business debt schedule;
- **Contingent liabilities:** An obligation that might happen, depending on the occurrence or outcome of another event, such as a lawsuit;

Equity = Assets-Liabilities

Amount of money that would be returned to a company's shareholders if all of the assets were liquidated and all of the company's debts paid off.

	A	B	C	D	E	F	G
1	<u>Introduction to Pro Forma Statements</u>						
2							
3	Assumptions			The balance sheet			
4					Current Assets		
5	Current Assets/Sales				Fixed Assets		
6	Fixed Assets/Sales				Total Assets		
7	Current Liabilities/Sales						
8	EQUITY				Current Liabilities		
9	DEBT				Debt		
10					Equity		
11	SALES				Total Liabilities+Equity		

Any **asset** which can reasonably be expected to be sold, consumed, or exhausted through the normal operations within the current **fiscal year**. Typical **current assets** include **cash**, **cash equivalents**, short-term investments.

Such assets are expected to be realised in cash or consumed during the normal operating cycle of the business.

	A	B	C	D	E	F	G
1	<u>Introduction to Pro Forma Statements</u>						
2							
3	Assumptions				The balance sheet		
4					<u>Current Assets</u>		
5	Current Assets/Sales				Fixed Assets		
6	Fixed Assets/Sales				Total Assets		
7	Current Liabilities/Sales						
8	EQUITY				Current Liabilities		
9	DEBT				Debt		
10					Equity		
11	SALES				Total Liabilities+Equity		

Also known as long-lived assets or property, plant and equipment (**PP&E**), they are assets/properties that may not easily be converted into cash. In most cases, only tangible assets are referred to as fixed.

Current assets = liquid (easily sold/bought)

Fixed assets = illiquid (difficult to be sold/bought)

	A	B	C	D	E	F	G
1	<u>Introduction to Pro Forma Statements</u>						
2							
3	Assumptions				The balance sheet		
4					Current Assets		
5	Current Assets/Sales			→	<u>Fixed Assets</u>		
6	Fixed Assets/Sales				Total Assets		
7	Current Liabilities/Sales						
8	EQUITY				Current Liabilities		
9	DEBT				Debt		
10					Equity		
11	SALES				Total Liabilities+Equity		

All liabilities of the business that are to be settled in cash within the fiscal year or the operating cycle of a given firm

	A	B	C	D	E	F	G
1	<u>Introduction to Pro Forma Statements</u>						
2							
3	Assumptions				The balance sheet		
4					Current Assets		
5		Current Assets/Sales			Fixed Assets		
6		Fixed Assets/Sales			Total Assets		
7		Current Liabilities/Sales					
8		EQUITY			<u>Current Liabilities</u>		
9		DEBT			Debt		
10					Equity		
11		SALES			Total Liabilities+Equity		

Amount owed for funds borrowed.

	A	B	C	D	E	F	G
1	<u>Introduction to Pro Forma Statements</u>						
2							
3	Assumptions				The balance sheet		
4					Current Assets		
5		Current Assets/Sales			Fixed Assets		
6		Fixed Assets/Sales			Total Assets		
7		Current Liabilities/Sales					
8		EQUITY			Current Liabilities		
9		DEBT			<u>Debt</u>		
10					Equity		
11		SALES			Total Liabilities+Equity		

Value of the assets after all liabilities have been subtracted

	A	B	C	D	E	F	G
1	<u>Introduction to Pro Forma Statements</u>						
2							
3	Assumptions				The balance sheet		
4					Current Assets		
5	Current Assets/Sales				Fixed Assets		
6	Fixed Assets/Sales				Total Assets		
7	Current Liabilities/Sales				Current Liabilities		
8	EQUITY				Debt		
9	DEBT				<u>Equity</u>		
10					Total Liabilities+Equity		
11	SALES						

We first input the assumptions that define the problem.

EXERCISE 1: DEBT PLUG	
Solve for the debt plug using the following assumptions:	
Current Assets/Sales	20%
Fixed Assets/Sales	50%
Current Liabilities/Sales	15%
EQUITY	\$40,000
DEBT	Plug
SALES	\$100,000

	A	B	C	D
1	<u>Introduction to Pro Forma Statements</u>			
2				
3	Assumptions			
4				
5	Current Assets/Sales			
6	Fixed Assets/Sales			
7	Current Liabilities/Sales			
8	EQUITY			
9	DEBT			
10				
11	SALES			

The balance sheet	
Current Assets	
Fixed Assets	
Total Assets	
Current Liabilities	
Debt	
Equity	
Total Liabilities+Equity	

We first input the assumptions that define the problem.

EXERCISE 1: DEBT PLUG

Solve for the debt plug using the following assumptions:

Current Assets/Sales	20%
Fixed Assets/Sales	50%
Current Liabilities/Sales	15%
EQUITY	\$40,000
DEBT	Plug
SALES	\$100,000

	A	B	C	D
1	<u>Introduction to Pro Forma Statements</u>			
2				
3	Assumptions			
4				
5		Current Assets/Sales	20%	
6		Fixed Assets/Sales	50%	
7		Current Liabilities/Sales	15%	
8		EQUITY	\$40,000	
9		DEBT	Plug	
10				
11		SALES	\$100,000	

The balance sheet

Current Assets	
Fixed Assets	
Total Assets	
Current Liabilities	
Debt	
Equity	
Total Liabilities+Equity	

We compute the corresponding quantities on the balance sheet.



	A	B	C	D	E	F	G
1	<u>Introduction to Pro Forma Statements</u>						
2							
3	Assumptions				The balance sheet		
4					Current Assets		
5		Current Assets/Sales	20%		Fixed Assets		
6		Fixed Assets/Sales	50%		Total Assets		
7		Current Liabilities/Sales	15%		Current Liabilities		
8		EQUITY	\$40,000		Debt		
9		DEBT	Plug		Equity		
10							
11		SALES	\$100,000		Total Liabilities+Equity		

We compute the corresponding quantities on the balance sheet.

	A	B	C	D	E	F	G
1	Introduction to Pro Forma Statements						
2							
3	Assumptions				The balance sheet		
4					Current Assets	\$20,000.0	=C5*C11
5	Current Assets/Sales		20%		Fixed Assets		
6	Fixed Assets/Sales		50%		Total Assets		
7	Current Liabilities/Sales		15%		Current Liabilities		
8	EQUITY		\$40,000		Debt		
9	DEBT		Plug		Equity		
10					Total Liabilities+Equity		
11	SALES		\$100,000				

We compute the corresponding quantities on the balance sheet.

	A	B	C	D	E	F	G
1	Introduction to Pro Forma Statements						
2							
3	Assumptions				The balance sheet		
4					Current Assets	\$20,000.0	=C5*C11
5	Current Assets/Sales		20%		Fixed Assets	\$50,000.0	=C6*C11
6	Fixed Assets/Sales		50%		Total Assets		
7	Current Liabilities/Sales		15%		Current Liabilities		
8	EQUITY		\$40,000		Debt		
9	DEBT		Plug		Equity		
10					Total Liabilities+Equity		
11	SALES		\$100,000				

Total assets are simply the sum of all types of assets you have.

	A	B	C	D	E	F	G
1	Introduction to Pro Forma Statements						
2							
3	Assumptions			The balance sheet			
4				Current Assets	\$20,000.0	=C5*C11	
5	Current Assets/Sales	20%		Fixed Assets	\$50,000.0	=C6*C11	
6	Fixed Assets/Sales	50%		Total Assets	\$70,000.0	=F4+F5	
7	Current Liabilities/Sales	15%		Current Liabilities			
8	EQUITY	\$40,000		Debt			
9	DEBT	Plug		Equity			
10				Total Liabilities+Equity			
11	SALES	\$100,000					

Again, we use the assumptions to fill up all the items in the balance sheet.

	A	B	C	D	E	F	G
1	Introduction to Pro Forma Statements						
2							
3	Assumptions			The balance sheet			
4				Current Assets	\$20,000.0	=C5*C11	
5	Current Assets/Sales	20%		Fixed Assets	\$50,000.0	=C6*C11	
6	Fixed Assets/Sales	50%		Total Assets	\$70,000.0	=F4+F5	
7	Current Liabilities/Sales	15%		Current Liabilities	\$15,000.0	=C7*C11	
8	EQUITY	\$40,000		Debt			
9	DEBT	Plug		Equity			
10				Total Liabilities+Equity			
11	SALES	\$100,000					

Debt is our "Plug", so we'll leave it for last ...

	A	B	C	D	E	F	G
1	Introduction to Pro Forma Statements						
2							
3	Assumptions			The balance sheet			
4				Current Assets	\$20,000.0	=C5*C11	
5	Current Assets/Sales	20%		Fixed Assets	\$50,000.0	=C6*C11	
6	Fixed Assets/Sales	50%		Total Assets	\$70,000.0	=F4+F5	
7	Current Liabilities/Sales	15%		Current Liabilities	\$15,000.0	=C7*C11	
8	EQUITY	\$40,000		Debt			
9	DEBT	Plug		Equity			
10							
11	SALES	\$100,000		Total Liabilities+Equity			

Again, we use the assumptions to fill up all the items in the balance sheet.

	A	B	C	D	E	F	G
1	Introduction to Pro Forma Statements						
2							
3	Assumptions			The balance sheet			
4				Current Assets	\$20,000.0	=C5*C11	
5	Current Assets/Sales	20%		Fixed Assets	\$50,000.0	=C6*C11	
6	Fixed Assets/Sales	50%		Total Assets	\$70,000.0	=F4+F5	
7	Current Liabilities/Sales	15%		Current Liabilities	\$15,000.0	=C7*C11	
8	EQUITY	\$40,000		Debt			
9	DEBT	Plug		Equity	\$40,000.0	=C8	
10				Total Liabilities+Equity			
11	SALES	\$100,000					

We have all the ingredients to fix the plug:
 $\text{Total assets} = \text{Current Liabilities} + \text{Debt} + \text{Equity}$

Total Liabilities

	A	B	C	D	E	F	G
1	<u>Introduction to Pro Forma Statements</u>						
2							
3	Assumptions				The balance sheet		
4					Current Assets	\$20,000.0	=C5*C11
5	Current Assets/Sales		20%		Fixed Assets	\$50,000.0	=C6*C11
6	Fixed Assets/Sales		50%		Total Assets	\$70,000.0	=F4+F5
7	Current Liabilities/Sales		15%		Current Liabilities	\$15,000.0	=C7*C11
8	EQUITY		\$40,000		Debt		
9	DEBT		Plug		Equity	\$40,000.0	=C8
10					Total Liabilities+Equity		
11	SALES		\$100,000				

We have all the ingredients to fix the plug:
 Total assets = Current Liabilities + Debt + Equity

Total Liabilities

	A	B	C	D	E	F	G
1	<u>Introduction to Pro Forma Statements</u>						
2							
3	Assumptions				The balance sheet		
4					Current Assets	\$20,000.0	=C5*C11
5	Current Assets/Sales		20%		Fixed Assets	\$50,000.0	=C6*C11
6	Fixed Assets/Sales		50%		Total Assets	\$70,000.0	=F4+F5
7	Current Liabilities/Sales		15%		Current Liabilities	\$15,000.0	=C7*C11
8	EQUITY		\$40,000		Debt	\$15,000.0	=F6-F8-F10
9	DEBT		Plug		Equity	\$40,000.0	=C8
10					Total Liabilities+Equity		
11	SALES		\$100,000				

Sum up total liabilities with equity

	A	B	C	D	E	F	G
1	<u>Introduction to Pro Forma Statements</u>						
2							
3	Assumptions				The balance sheet		
4					Current Assets	\$20,000.0	=C5*C11
5	Current Assets/Sales		20%		Fixed Assets	\$50,000.0	=C6*C11
6	Fixed Assets/Sales		50%		Total Assets	\$70,000.0	=F4+F5
7	Current Liabilities/Sales		15%		Current Liabilities	\$15,000.0	=C7*C11
8	EQUITY		\$40,000		Debt	\$15,000.0	=F6-F8-F10
9	DEBT		Plug		Equity	\$40,000.0	=C8
10					Total Liabilities+Equity	\$70,000.0	=F8+F9+F10
11	SALES		\$100,000				

$$\text{Total Assets} = \text{Total Liabilities} + \text{Equity}$$

	A	B	C	D	E	F	G
1	Introduction to Pro Forma Statements						
2							
3	Assumptions			The balance sheet			
4				Current Assets		\$20,000.0	
5	Current Assets/Sales		20%	Fixed Assets		\$50,000.0	=C6*C11
6	Fixed Assets/Sales		50%	Total Assets		\$70,000.0	=F4+F5
7	Current Liabilities/Sales		15%	Current Liabilities		\$15,000.0	=C7*C11
8	EQUITY		\$40,000	Debt		\$15,000.0	=F6-F8-F10
9	DEBT		Plug	Equity		\$40,000.0	=C8
10				Total Liabilities+Equity		\$70,000.0	=F8+F9+F10
11	SALES		\$100,000				