FINANCIAL FORECASTING IN PYTHON

# Introduction to financial statements

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# About this course

- Analyze data in a simple way

- Using Python

- Model different sources of data

- Financial forecasting basics

# Financial statements, an introduction

- Records of financial information

- Universal format and clear structure

- Used for decision making

- Important metrics for forecasting

# Types of financial statements



**1. Income Statement**

Income and Expenses

**2. Balance Sheet**

Assets, Liabilities and Capital

**3. Cash Flow Statement**

**4. Statement of Shareholder's Equity**

# How financial statements are used in forecasting

- Build on the important metrics

- Shows financial health of a company

- Provides structure for solid financial forecasting

# The income statement \ profit & loss statement

Two important elements:

- Gross Profit:

  **DIRECT** sales and costs

- Net Profit:

  **INDIRECT** income and expenses

**Income Statement**

| Mark's Gadget Shop | | |
|---|---|---|
| Sales | | 1,000 |
| Costs of Goods Sold | - | 600 |
| **Gross Profit** | | **400** |
| | | |
| Operating Expenses | | |
| Selling and Admin | - | 100 |
| R&D Expense | - | 30 |
| Training | - | 20 |
| **Total Operating Expenses** | - | **150** |
| | | |
| **Net Profit** | | **250** |

# Gross profit

## DIRECT sales and costs

```
cogs = material_costs +
       direct_labor_costs +
       factory_costs
```

```
gross_profit = sales - cogs
```

### Income Statement

**Mark's Gadget Shop**

| | | |
|---|---|---|
| Sales | | 1,000 |
| Costs of Goods Sold | - | 600 |
| **Gross Profit** | | **400** |
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| **Total Operating Expenses** | - | 150 |
| | | |
| **Net Profit** | | 250 |

# Net profit

**INDIRECT** income and expenses

```
opex = insurance +
       admin_sales +
       r_d +
       training_cost +
       other_non_direct_costs
```

```
net_profit = gross_profit - opex
```

**Income Statement**

| Mark's Gadget Shop | | |
|---|---|---|
| Sales | | 1,000 |
| Costs of Goods Sold | - | 600 |
| **Gross Profit** | | **400** |
| | | |
| Operating Expenses | | |
| Selling and Admin | - | 100 |
| R&D Expense | - | 30 |
| Training | - | 20 |
| **Total Operating Expenses** | - | **150** |
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| **Net Profit** | | **250** |

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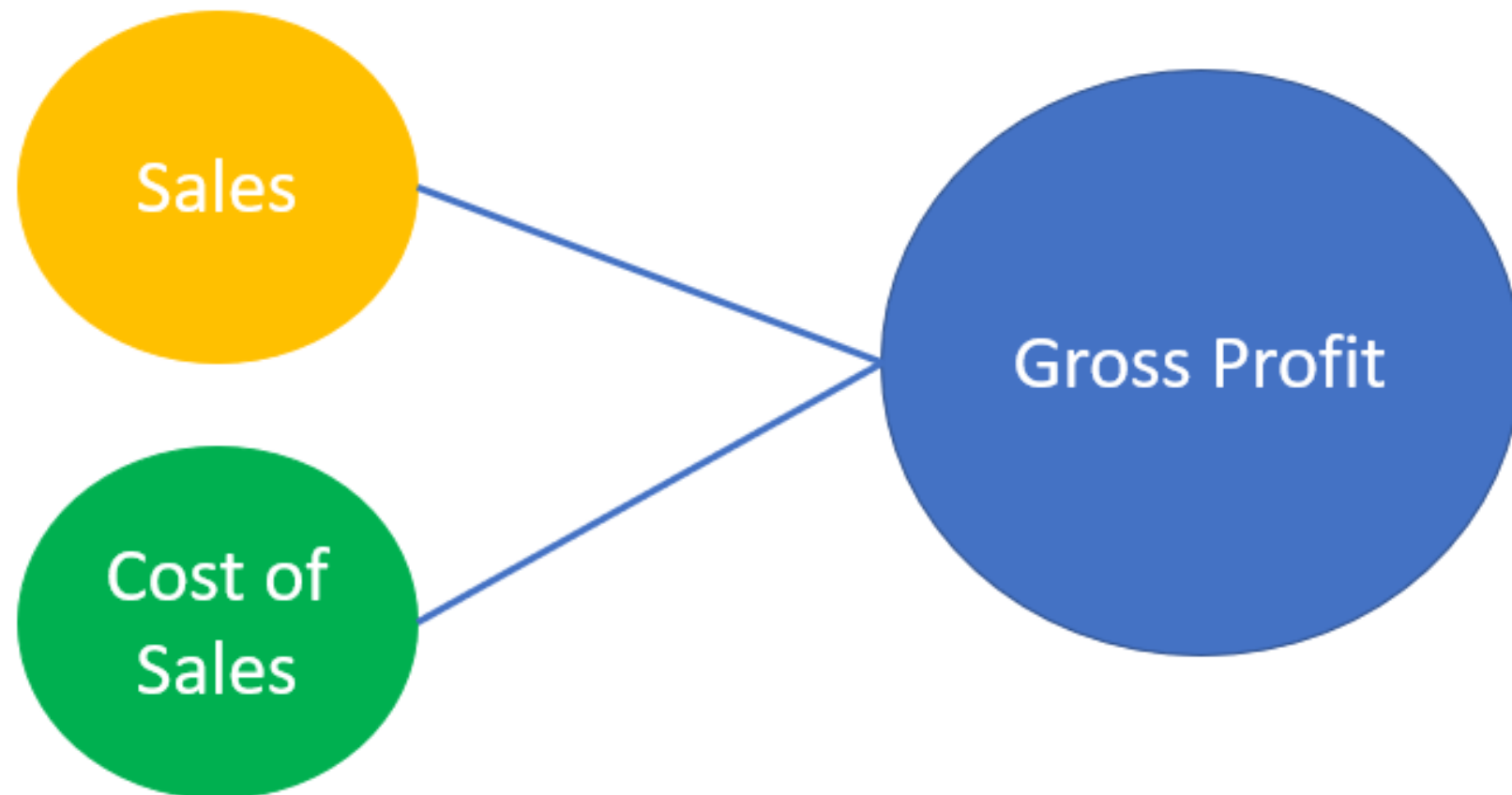# Let's practice!

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# Calculating sales and the cost of goods sold

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# Calculating sales and the cost of goods sold

# Calculating sales

Sales = Income = Revenue = Turnover

Data needed:

- Sales price per unit `sp_unit`

- Number of units sold `units`

Complexities

- Discounts (Discounted Sales Price)

  `d_sp`

- Credit sales

- Sales mix `sp_1` vs `sp_2`

# Calculating Cost of Goods Sold (COGS)

Data needed:

- `fixed_costs`

    - Costs independent of units

- `Variable_costs_per_unit`

    - Costs incurred per unit produced

- Inventory opening balance `inv_ob`

- Inventory closing balance `inv_cb`

# What does the gross profit tell us?

- Profit margin (%)

    - `gp_margin`

- Analyze the profitability of our core product

- Calculate the break–even point

```
break_even = fixed_costs/(sp - variable_costs)
```

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# Let's practice!

FINANCIAL FORECASTING IN PYTHON

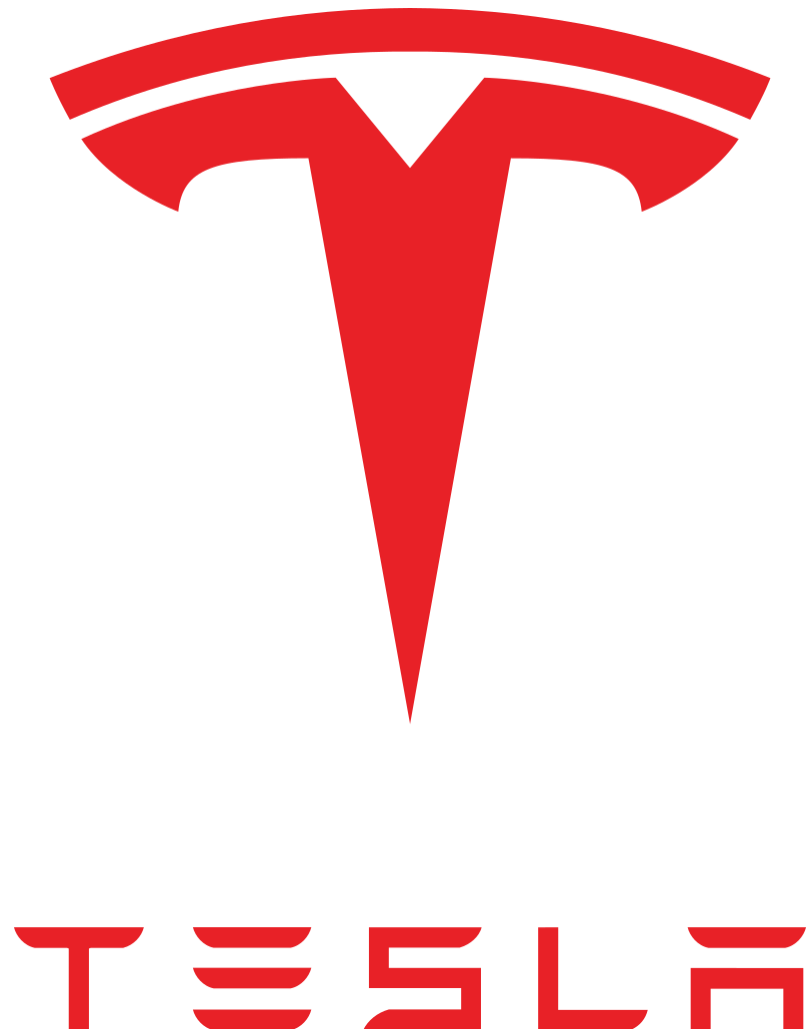# Working with raw datasets

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# Obtaining a dataset for forecasting

- Tesla Motors Inc.

- Historic information publicly available

- Income statement as .csv

# First look

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | TESLA INC (TSLA) CashFlowFlag INCOME STATEMENT | | | | | | |
| 2 | Fiscal year ends in December. USD in millions except per share | 2012-12 | 2013-12 | 2014-12 | 2015-12 | 2016-12 | TTM |
| 3 | Revenue | 413 | 2013 | 3198 | 4046 | 7000 | 10755 |
| 4 | Cost of revenue | 383 | 1557 | 2317 | 3123 | 5401 | 8536 |
| 5 | Gross profit | 30 | 456 | 882 | 924 | 1599 | 2219 |
| 6 | Operating expenses | | | | | | |
| 7 | Research and development | 274 | 232 | 465 | 718 | 834 | 1269 |
| 8 | Sales, General and administrative | 150 | 286 | 604 | 922 | 1432 | 2250 |
| 9 | Total operating expenses | 424 | 518 | 1068 | 1640 | 2267 | 3520 |
| 10 | Operating income | -394 | -61 | -187 | -717 | -667 | -1301 |
| 11 | Interest Expense | 0 | 33 | 101 | 119 | 199 | 390 |
| 12 | Other income (expense) | -2 | 23 | 3 | -40 | 120 | 53 |
| 13 | Income before taxes | -396 | -71 | -285 | -876 | -746 | -1638 |
| 14 | Provision for income taxes | 0 | 3 | 9 | 13 | 27 | 52 |
| 15 | Net income from continuing operations | -396 | -74 | -294 | -889 | -773 | -1689 |
| 16 | Other | | | | | 98 | 282 |
| 17 | Net income | -396 | -74 | -294 | -889 | -675 | -1407 |
| 18 | Net income available to common shareholders | -396 | -74 | -294 | -889 | -675 | -1407 |
| 19 | Earnings per share | | | | | | |
| 20 | Basic | -3.69 | -0.62 | -2.36 | -6.93 | -4.68 | -8.54 |
| 21 | Diluted | -3.69 | -0.62 | -2.36 | -6.93 | -4.68 | -8.54 |
| 22 | Weighted average shares outstanding | | | | | | |
| 23 | Basic | 107 | 119 | 125 | 128 | 144 | 162 |
| 24 | Diluted | 107 | 119 | 125 | 128 | 144 | 162 |
| 25 | EBITDA | -367 | 68 | 48 | -334 | 400 | 246 |

# Filtering the data in Python

```python
# Choose some interesting metrics
interesting_metrics = ['Gross profit', 'Net income']
```

```python
# Using the .isin() method, filter for rows containing these metrics
filter = income_statement.metric.isin(interesting_metrics)
filtered_income_statement = income_statement[filter]

print(filtered_income_statement)
```

| metric | 2012-12 | 2013-12 | 2014-12 | 2015-12 | 2016-12 | TTM |
|---|---|---|---|---|---|---|
| Gross profit | 30.0 | 456.0 | 882.0 | 924.0 | 1599.0 | 2219.0 |
| Net income | -396.0 | -74.0 | -294.0 | -889.0 | -675.0 | -1407.0 |

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# Let's practice!