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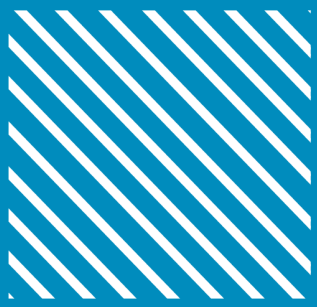

Financial Modeling Handbook

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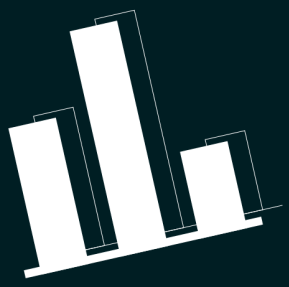

#1 Financial Ratios

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FINANCIAL RATIOS

LIQUIDITY RATIOS

Current Ratio

Will we have enough money to pay suppliers?

$$\frac{\text{Current Assets}}{\text{Current Liabilities}}$$

Benchmark: at least 1.00, preferably 2.00

Quick Ratio (Acid Test)

Will we be able to pay our suppliers in the near future?

$$\frac{\text{Current Assets - Inventory}}{\text{Current Liabilities}}$$

Benchmark: 0.5 - 1.00

Absolute Liquidity Ratio

How much of our suppliers' debts will we be able to cover with the funds in the account?

$$\frac{\text{Cash and its equivalents}}{\text{Current Liabilities}}$$

Benchmark: 0.05 - 0.20

Do not include such items in your calculations:
- short-term loans from owners,
- payments of the next period,
- unpaid dividends,
- short-term loans to owners,
- liabilities for unused leave, etc.

BUSINESS ACTIVITY RATIOS

Debtor Days

How quickly do our debtors pay us after the transaction?

$$\frac{\text{Average Debtors}}{\text{Turnover}} \times 365$$

Inventory Days

How fast can we sell our stock after purchase?

$$\frac{\text{Average Inventory}}{\text{COGS}} \times 365$$

Creditor Days

How long do our suppliers allow them to not pay for stocks after purchasing them?

$$\frac{\text{Average Creditors}}{\text{Purchases}} \times 365$$

Cash Conversion Cycle

How long is cash tied up in inventory before the inventory is sold and cash is collected from customers?

Inventory Days + Debtor Days - Creditor Days

- To calculate average receivables or stocks, the average between the year-start and year-end balance sheets is used. Accordingly, these indicators are significantly affected by the closing balance! It is worth following them every month in your company.
- Turnover's cost of sales is not equal to production cost - the cost of purchasing and delivering items must be taken into account.
- Accounts payable should only be used for trade receivables. Depending on the situation, the bank's short-term liabilities, which are taken directly to finance inventories, can be used.
- All turnover figures are measurable in days.

PROFITABILITY RATIOS

Average Markup

What is the average transaction markup for this company?

$$\frac{\text{Turnover}}{\text{COGS}}$$

Gross Margin

How many percent remain in circulation after covering all production costs?

$$\frac{\text{Gross Profit}}{\text{Turnover}}$$

EBITDA Margin or Operating Margin

How many percent remain in circulation after covering all operating costs?

$$\frac{\text{EBITDA}}{\text{Turnover}}$$

Net Margin

How many percent remain in circulation after covering all costs?

$$\frac{\text{Net Profit}}{\text{Turnover}}$$

Return on Assets

How profitable are the total assets in the company?

$$\frac{\text{EBIT}}{\text{Average Assets}}$$

Return on Equity

How profitable is the owners' investment in the company?

$$\frac{\text{Net Profit}}{\text{Average Equity}}$$

All averages are measured as the average between the beginning and the end of the year. The calculation of equity should also include owner loans to the company, unpaid dividends, deferred CIT, provisions, etc.

CAPITAL STRUCTURE RATIOS

Equity Ratio

Do we have enough of our own money in the company?

$$\frac{\text{Total Equity}}{\text{Total Assets}}$$

Benchmark: >20%

Comparison rate

It is worth calculating only for competitors - what could be their interest rate in the bank? You know your own % rate from credit agreements.

$$\frac{\text{\% payments}}{\text{Average loan balances}}$$

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Debt-Service Coverage Ratio (DSCR)

Do we earn more than we have to pay the bank?

$$\frac{\text{EBITDA}}{\%\text{ + principal payments}}$$

Benchmark: >120%

Debt/EBITDA

In how many years would the company be able to return all its loans to the bank?

$$\frac{\text{Bank loans balance}}{\text{EBITDA}}$$

Benchmark: <4.00, for long-term real estate projects - more.

To calculate the average balance sheet ratios (assets, loan balances), the average between the beginning and the end of the year balance sheet is used. Accordingly, these figures are affected by the closing balance (but not as significant as receivables, inventories or trade receivables)! It is worth following them every month in your company.

EBITDA = earnings before interest, taxes, depreciation and amortization

EBITDA = net profit + CIT + % payments + depreciation + amortization

ALTMAN Z-SCORE

Z-Score

What is the probability of bankruptcy of the company?

$$Z=1.2A+1.4B+3.3C+0.6D+1.0E$$

Z <1.8. Very high probability of bankruptcy in the near future

1.8 < Z <2.7. Moderate probability of bankruptcy in the next 2 years

Z > 2.7. Minimal probability of bankruptcy in the next 2 years

A. Proportion of working capital

$$\frac{\text{Working Capital}}{\text{Total Assets}}$$

Share of working capital in assets

B. Proportion of retained earnings

$$\frac{\text{Retained Earnings}}{\text{Total Assets}}$$

Proportion of retained earnings in assets

C. EBIT Yield

$$\frac{\text{Earnings Before Interest and Tax}}{\text{Total Assets}}$$

EBIT to asset ratio

D. Equity versus liabilities

$$\frac{\text{Market Value of Equity}}{\text{Total Liabilities}}$$

Equity to liabilities ratio

E. Movement of assets

$$\frac{\text{Sales}}{\text{Total Assets}}$$

Asset turnover ratio

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#2 Depreciation Methods

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DEPRECIATION METHODS

How to find out an asset's depreciation expense in a given year under each method?

STRAIGHT - LINE depreciation

$$\frac{\text{Cost}}{\text{Useful Life}}$$

The most common and easiest method to calculate depreciation. To use this method of depreciation, you need to divide the cost of an asset by the useful life of an asset (in years).

	Year 1	Year 2	Year 3	Year 4	Year 5
Opening Book Value	100000	80000	60000	40000	20000
Depreciation	20000	20000	20000	20000	20000
Ending Book Value	80000	60000	40000	20000	0

DECLINING BALANCE depreciation

$$\text{Opening book value} * \text{Depreciation rate (\%)}$$

$$\text{Depreciation rate (\%)} = \frac{100\%}{\text{Useful Life of asset}}$$

The declining balance depreciation is used to calculate large depreciation expenses. It is also good to use for assets that quickly lose their value.
To use this method, you have to firstly find out the depreciation rate and then multiply it by its current book value. Remember that book value goes over the useful life!

	Year 1	Year 2	Year 3	Year 4	Year 5
Opening Book Value	100000	80000	64000	51200	40960
Depreciation rate	0.2	0.2	0.2	0.2	0.2
Depreciation	20000	16000	12800	10240	8192
Ending Book Value	80000	64000	51200	40960	32768

DOUBLE DECLINING BALANCE depreciation

$$\text{Opening book value} * \text{Depreciation rate (\%)}$$

$$\text{Depreciation rate (\%)} = \frac{100\%}{\text{Useful Life of asset}} * 2$$

Double declining balance method implies a larger depreciation value in the first years of buying an asset. It is done to reflect the productivity of assets (they are more productive in their early years) and the fact that assets typically lose more value in the first years of use. The method differs from regular declining balance depreciation only in the fact that depreciation rate is multiplied by 2.

	Year 1	Year 2	Year 3	Year 4	Year 5
Opening Book Value	100000	60000	36000	21600	12960
Depreciation rate	0.4	0.4	0.4	0.4	0.4
Depreciation	40000	24000	14400	8640	5184
Ending Book Value	60000	36000	21600	12960	7776

SUM - OF - THE - YEARS DIGITS depreciation

This is an accelerated depreciation method, which makes the depreciation expense higher in the early years and lower in the latter years of an asset. To calculate depreciation using this method, you need to multiply the cost of an asset by its useful life over the sum of the years digits.

$$\text{Cost} * \frac{\text{Useful life}}{\text{Sum of the years digits}}$$

	Year 1	Year 2	Year 3	Year 4	Year 5
Opening Book Value	100000	66667	40000	20000	6667
Remaining Life	5	4	3	2	1
Depreciation	33333	26667	20000	13333	6667
Ending Book Value	66667	40000	20000	6667	0

ADJUSTED MACRS depreciation

Modified Accelerated Cost Recovery System (MACRS) allows a business to recover capitalized costs of assets that lose its value over time. To use this method, you have to find out property class of an asset, as MACRS system puts assets into classes with specific depreciation periods and assigns specific pre-defined % of each year for different asset classes.

$$\text{Opening BV} * \text{Depreciation rate}$$

	Year 1	Year 2	Year 3	Year 4	Year 5
Opening Book Value	100000	60000	36000	21600	10800
Depreciation rate	40.0%	24.0%	14.4%	10.8%	10.8%
Depreciation	40000	24000	14400	10800	10800
Ending Book Value	60000	36000	21600	10800	0

SERVICE HOUR depreciation

Service hour depreciation method is mainly used for transport vehicle depreciation since it takes into consideration “running time” of the asset. To calculate depreciation using this method, you have to divide asset’s net cost by its service life and multiply by its ours used in a year.

$$\text{hours used in a year} * \frac{\text{Cost}}{\text{Service life}}$$

	Year 1	Year 2	Year 3	Year 4	Year 5
Opening Book Value	100000	84000	72000	60000	52000
Hours used in a year	2000	1500	1500	1000	800
Cost of 1 machine hour	8	8	8	8	8
Depreciation	16000	12000	12000	8000	6400
Ending Book Value	84000	72000	60000	52000	45600

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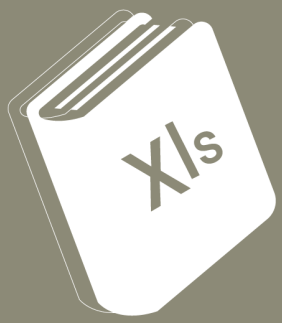

#3

Top 10 Excel Functions

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Financial Modeling in Excel

10 Excel functions you should know

=SUMIFS()

SUMIFS function adds all of its arguments that meet multiple criteria. For example, you would use SUMIFS in your financial model to sum up the sales of (1) a specific employee (2) for a specific product.

=SUMIFS

(sum range (e.g. sales),
criteria range 1 (e.g. employee),
criteria 1 (e.g. Tim),
criteria range 2 (e.g. Product),
criteria 2, (e.g. Chairs)**)**

Employee	Product	Sales
Laura	Tables	$3,441
Mike	Chairs	$5,110
Tim	Pillows	$5,643
Phoebe	Tables	$4,921
Tim	Chairs	$4,839
Phoebe	Chairs	$3,768
Mike	Chairs	$4,707
Laura	Beds	$5,361
Tim	Chairs	$3,304
Phoebe	Tables	$4,744

Employee	Product	Sales
Tim	=SUMIFS(F8:F17,D8:D17,D21,E8:E17,E21)	

SUMIFS(sum_range, criteria_range1, **criteria1**, [criteria_range2, criteria2], [criteria_range3, criteria3], ...)

Chairs **$8,143**

Know your IFs, COUNTIFs, AVERAGEIFs and all other IFs too - after all, financial modeling is just a series of IFs that could happen in this world.

=IFERROR()

Use IFERROR function to format your financial models. The function checks for errors and returns the value specified by the user if found. The function checks for the following errors: #N/A, #VALUE!, #REF!, #DIV/0!, #NUM!, #NAME? or #NULL!.

=IFERROR(value, value_if_error)

Month	Total Wages Allocated	Employees	Wage
Jan	$3,200	2	$1,600
Feb	$1,600	1	$1,600
Mar (shop closed)	$0	0	=IFERROR(D10/E10,0)

IFERROR(**value**, value_if_error)

No IFFERROR	#DIV/0!
IFERROR	$0

Financial Modeling in Excel

10 Excel functions you should know

=XIRR()

Internal rate of return metric is needed to find out the annual growth rate of an investment. The higher the IRR, the better the investment (keeping all other factors the same, of course). IRR is good for comparing different investment opportunities.

=XIRR(cash flow values, dates of cash flows)

	1	2	3	4	5
Date	7/12/2021	8/11/2021	9/10/2021	10/10/2021	11/9/2021
Cash Flow	-1000	-550	750	1000	1250

IRR	=XIRR(E6:I6,E5:I5)

XIRR(values, dates, [guess])

=XNPV()

Finance is money and we all know that money today is worth more than tomorrow. Financial analysts oftentimes have to calculate the value of an investment/company/project in today's terms.

=XNPV(discount rate, cash flow values, dates of cash flow)

	1	2	3	4	5
Date	7/12/2021	8/11/2021	9/10/2021	10/10/2021	11/9/2021
Cash Flow	-1000	-550	750	1000	1250

Discount Rate	9%
NPV	=XNPV(E8,E6:I6,E5:I5)

XNPV(rate, values, dates)

Unlike IRR and NPV, XIRR and XNPV functions allow for payments at irregular intervals

Financial Modeling in Excel

10 Excel functions you should know

=PMT()

PMT function calculates the payment for a loan based on constant payments and a constant interest rate. You have to know the present loan value, number of periods and the interest rate. PMT, PPMT and IPMT functions are needed to figure out annuity loan repayments (e.g. mortgage)

=PMT (interest rate, number of periods, present value)

Present Value	$ 2,000
Number of periods	10
Interest Rate	5%
PMT	=PMT(E8,E7,E6)
Monthly PMT	($21.58)

PMT(**rate**, nper, pv, [fv], [type])

=PMT() calculates periodic payment for a loan in total

=PPMT() calculates the payment on the princi-pal for a loan

=IPMT() calculates the interest payment on the loan

=SLOPE()

If you're into investment banking, at some point you'll have to calculate the Beta of a stock, which means volatility. By using the SLOPE function in Excel, you'll find it easily by using the returns of the stock and the comparative benchmark index.

=SLOPE

(% of equity change range, % range of change of index)

	J	K	L	M	N	O	P	Q
	BETA	=SLOPE(L7:L52;Q7:Q52)						
		SLOPE(known_ys; known_xs)						
		STOCK				INDEX		
		Date	Close	Change		Date	Close	Change
		11.10.2021	$ 294.23			11.10.2021	$14,445.00	
		12.10.2021	$ 292.88	-0.4609		12.10.2021	$14,525.00	0.550775
		13.10.2021	$ 296.31	1.1576		13.10.2021	$14,800.00	1.858108
		14.10.2021	$ 302.75	2.1272		14.10.2021	$14,935.00	0.903917
		15.10.2021	$ 304.21	0.4799		15.10.2021	$14,910.00	-0.16767
		18.10.2021	$ 307.29	1.0023		18.10.2021	$15,015.00	0.699301
		19.10.2021	$ 308.23	0.305		19.10.2021	$15,145.00	0.858369
		20.10.2021	$ 307.41	-0.2667		20.10.2021	$15,190.00	0.296248
		21.10.2021	$ 310.76	1.078		21.10.2021	$15,285.00	0.621524
		22.10.2021	$ 309.16	-0.5175		22.10.2021	$15,445.00	1.035934
		25.10.2021	$ 308.13	-0.3343		25.10.2021	$15,465.00	0.129324
		26.10.2021	$ 310.11	0.6385		26.10.2021	$15,475.00	0.06462
		27.10.2021	$ 323.17	4.0412		27.10.2021	$15,490.00	0.096837
		28.10.2021	$ 324.35	0.3638		28.10.2021	$15,580.00	0.577664
		29.10.2021	$ 331.62	2.1923		29.10.2021	$15,605.00	0.160205
		01.11.2021	$ 329.37	-0.6831		01.11.2021	$15,715.00	0.699968

Financial Modeling in Excel

10 Excel functions you should know

=XLOOKUP

Lookup functions are a must to know for any modeler. They are used to quickly and easily find data in a table, for example, to find the amount sold by an employee, ID number, and thousands of other things.

=XLOOKUP(what do you want to look up, where can it be found, what do you want to return)

Employee	Sold
Laura	$5,000
Mike	$4,000
Tim	$2,900
Phoebe	$5,120

Laura	=XLOOKUP(C14,C9:C12,D9:D12)

XLOOKUP(lookup_value, lookup_array, return_array,

=INDEX() & MATCH()

Sometimes, XLOOKUP won't do the job, as it can only compare one array with another one. Index and Match function combination can look up values in the whole table - it's 2 Dimensional.

=INDEX
(what you want to return,

=MATCH
(what are you looking for, where can it be found)

Select: Player Stage Points

=INDEX($B$7:$G$10,MATCH($B$3,$B$7:$B$10,0),MATCH($C$3,$B$7:$G$7,0))

MATCH(lookup_value, **lookup_array**, [match_type])

Diarmuid Early Stage 3	830

Player	Stage 1	Stage 2	Stage 3	Stage 4	Total
Laurence Lau	1000	957	1000	959	3916
Diarmuid Early	821	1000	830	1000	3651
Andrew Ngai	847	899	815	838	3399

Financial Modeling in Excel

10 Excel functions you should know

=EOMONTH()

EOMONTH function finds the last day of the month after you add a specific number of months to a date. It's useful for calculating maturity dates or due dates that fall on the last day of the month. It also aids in setting up your financial model.

=EOMONTH (start_date, months you want to add/substract)

Today	Date of the last day of the month, 12 months after today
7/12/2022	=EOMONTH(E7,12)
	7/31/2023

EOMONTH(**start_date**, months)

=EDATE() will aid in adding months to a specified start date

Jan	Feb	Mar	=EOMONTH(H13,1)	Jul

EOMONTH(start_date, months)

=SEQUENCE

The SEQUENCE function allows you to generate a list of sequential numbers in an array. SEQUENCE function works great if you need to generate a list of 10,000 numbers in a column.

=SEQUENCE (number of rows you want to generate, number of columns you want to generate, starting point, step)

=SEQUENCE(5,5)	3	4	5
SEQUENCE(rows, [columns], [start], [step])		9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

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#4

Inventory Valuation

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INVENTORY VALUATION

FIFO 

First-In, First-Out

Selling oldest units of inventory first

FIFO should definitely be used when accounting for perishable items, for example, food items.

This is the most logical method for most companies.

Under FIFO method, COGS (Cost of Good Sold) will be calculated using the oldest inventory purchasing costs first. Due to inflation, these inventory costs are lower than for recently purchased inventory units. Due to these lower costs, you will see higher net income in the balance sheet.

LIFO 

Last-In, Last-Out

Selling last units that arrive in inventory first

Under the LIFO method, opposite from FIFO, you will see a lower net income. As the most recently purchased items are usually the most expensive ones (due to inflation), the inventory costs will be higher.

However, the decrease in profits also means a smaller corporate tax expense.

LIFO is usually used when inflation is high and by companies that have large inventories (e.g., retailers).

Example

Purchases			
Month	Units	Price/Unit	Total Cos
January	50	$50	$2,500
February	80	$60	$4,800
March	100	$70	$7,000
Total	**230**		**$14,300**

130 Units Sold

230-130=100 Units Left

FIFO

FIFO COGS		
	Units @ Price	Total Cost
1	50 @ 50$	$2,500
2	80 @ 60$	$4,800
Total	**130**	**$7,300**

FIFO Ending Inventory		
	Units @ Price	Total Cost
1	100 @ 70$	**$7,000**
Total	**100**	**$7,000**

LIFO

LIFO COGS		
	Units @ Price	Total Cost
1	100 @ 70$	$7,000
2	30 @ 60$	$1,800
Total	**130**	**$8,800**

LIFO Ending Inventory		
	Units @ Price	Total Cost
1	50 @ 50$	$2,500
2	50 @ 60$	$ 3,000
Total	**100**	**$5,500**

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#5

What is BETA?

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What is β?

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Beta is a risk management tool, widely used in financial modeling. It demonstrates the volatility (riskiness) of an asset or a portfolio in correlation to the market. In reality, most professionals use some bechmark index, for example, S&P 500.

Formula

The "textbook" formula for beta is:

$$\beta = \frac{\text{Covariance}}{\text{Variance}}$$

- Covariance: Measures a security's return relative to the market's.
- Variance: Indicates how the market moves in relation to its mean.

Interpretation

It is assumed that the market has a beta of 1. If beta of a security is >1, the security is more volatile (more risky) than the market, however, in case it is <1, the stock is less volatile (less risky).
Betas are useful for calculating yields and returns for securities.

Beta in Excel

Here are the steps to calculate Beta in Excel:

1) Retrieve the historical price of a security and the benchmark index in 2 separate columns. You can either export it from online sources or use the =STOCKHISTORY function.

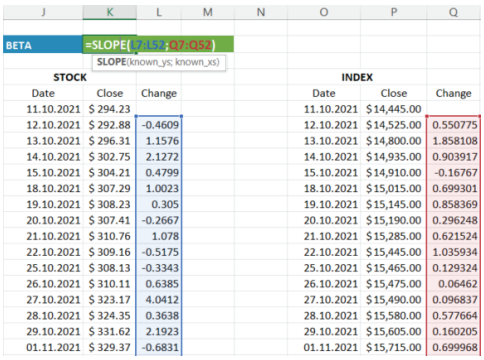
2) Calculate the price change for the security in percentage with the use of this formula:

$$\Delta = \frac{\text{Current price - Price for previous date}}{\text{Price for previous date}} \times 100$$

3) Calculate Beta using the SLOPE function. It works the following way: SLOPE (known_ys; known_xs). Known_ys stand for % of equity change range, and known_xs mean % range of change of index. The returned value is the beta.

Example

Assuming there is a security with a daily change in price calculated in cells L7:L52 and the daily change of an index calculated in cells Q7:Q52, the formula in Excel should look like =SLOPE (L7:L52; Q7:Q52). The returned value is the beta.
In this case, the result is 0.36, implying that this particular stock is less volatile than the market.



STOCK				INDEX		
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#6 Options Pricing

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OPTIONS PRICING

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WHAT ARE OPTIONS?

Options are **derivative financial instruments** dependent on the value of **underlying securities**, for example, stocks. The owner of the option has the **right** but **not** the **obligation** to use the option.

CALL VS. PUT

- A **call** option is a contract giving its owner **the right to buy** shares of a stock at a fixed price.

- A **put** option is a contract giving its owner the **right to sell** shares of a stock at a fixed price.

AMERICAN VS. EUROPEAN OPTIONS

- If the option can be exercised **any time** before the maturity date it is called an **American** option.

- If it is only possible to exercise it **at the date** of expiration, it is termed a **European** option.

PAYOFF VS. PROFIT

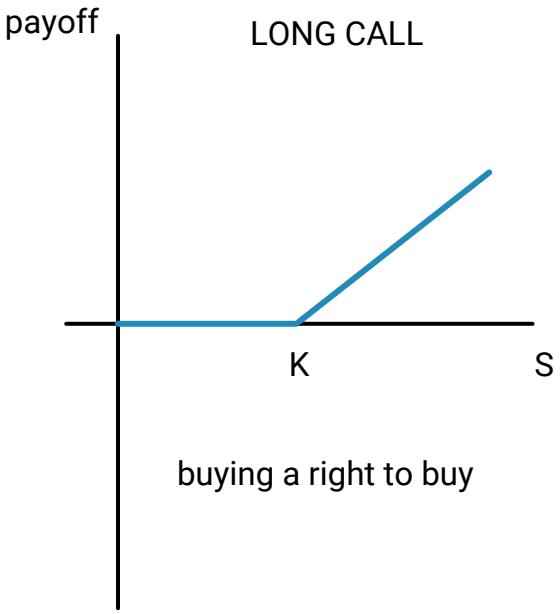
Option **payoff** implies the **gross value** of an option at the maturity date, excluding the initial transfer of the premium.

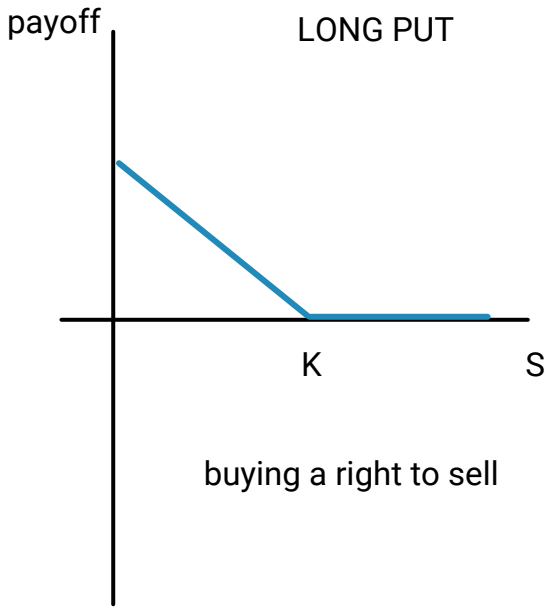
Option **profit** means showing the **net gain or loss** of a position in options by also accounting for the costs and gains of establishing the position.

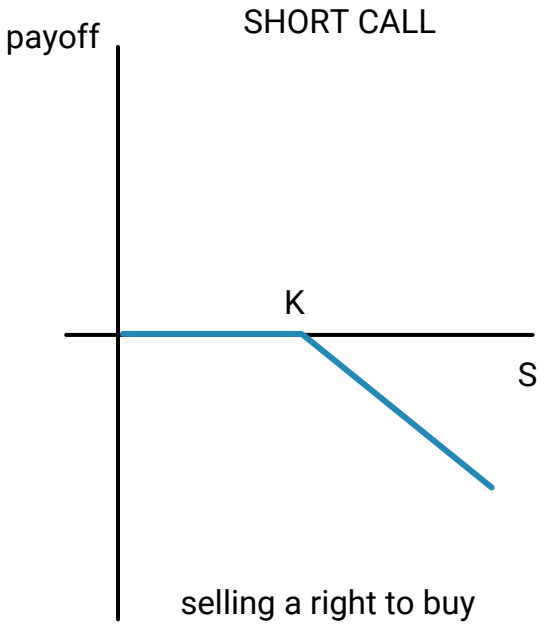
USEFUL TERMS AND ABBREVIATIONS IN OPTIONS PRICING

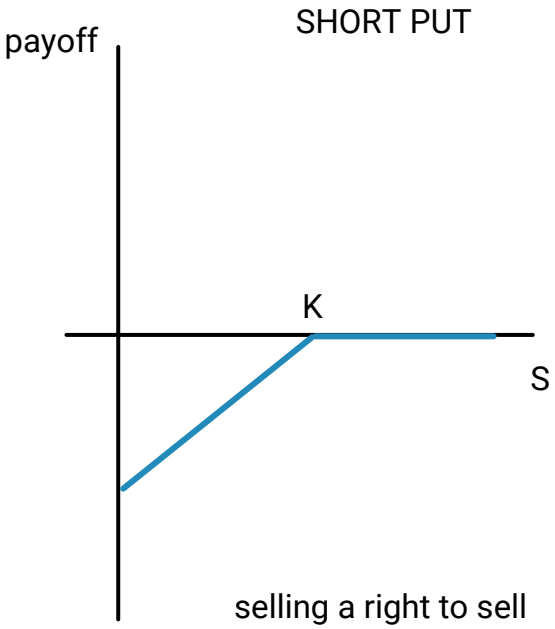
S = The current price of the underlying stock
C = The current value of the associated call
P = The current value of the associated put
K = The exercise price of the option (aka E or X) - the price at which the underlying security can be bought or sold when trading options.
r_f = The risk-free interest rate
T = time to maturity
σ = Standard deviation of the price of the underlying stock (not used in this stage case for simplicity)

PAYOFF DIAGRAMS









USEFUL FORMULAS IN OPTIONS PRICING:

r = annual (nominal) interest rate *e = mathematical constant ~ 2.71828*

$$u = e^{\text{growth rate}} \qquad d = \frac{1}{u}$$

$$P_u = \frac{e^{r_f} - d}{u - d} \qquad P_d = 1 - P_u$$

u = upstep d= downstep r_f= annual risk-free interest rate
P_u = probability of upstep P_d = probability of downstep

$$\text{Annual Discount Factor} = e^{-r_f}$$

Option value = (payoff from upstep * probability of upstep + payoff from downstep * probability of downstep) * annual discount factor

Prepared by JP Delavin and FMWC team

EXAMPLE - EUROPEAN CALL OPTION

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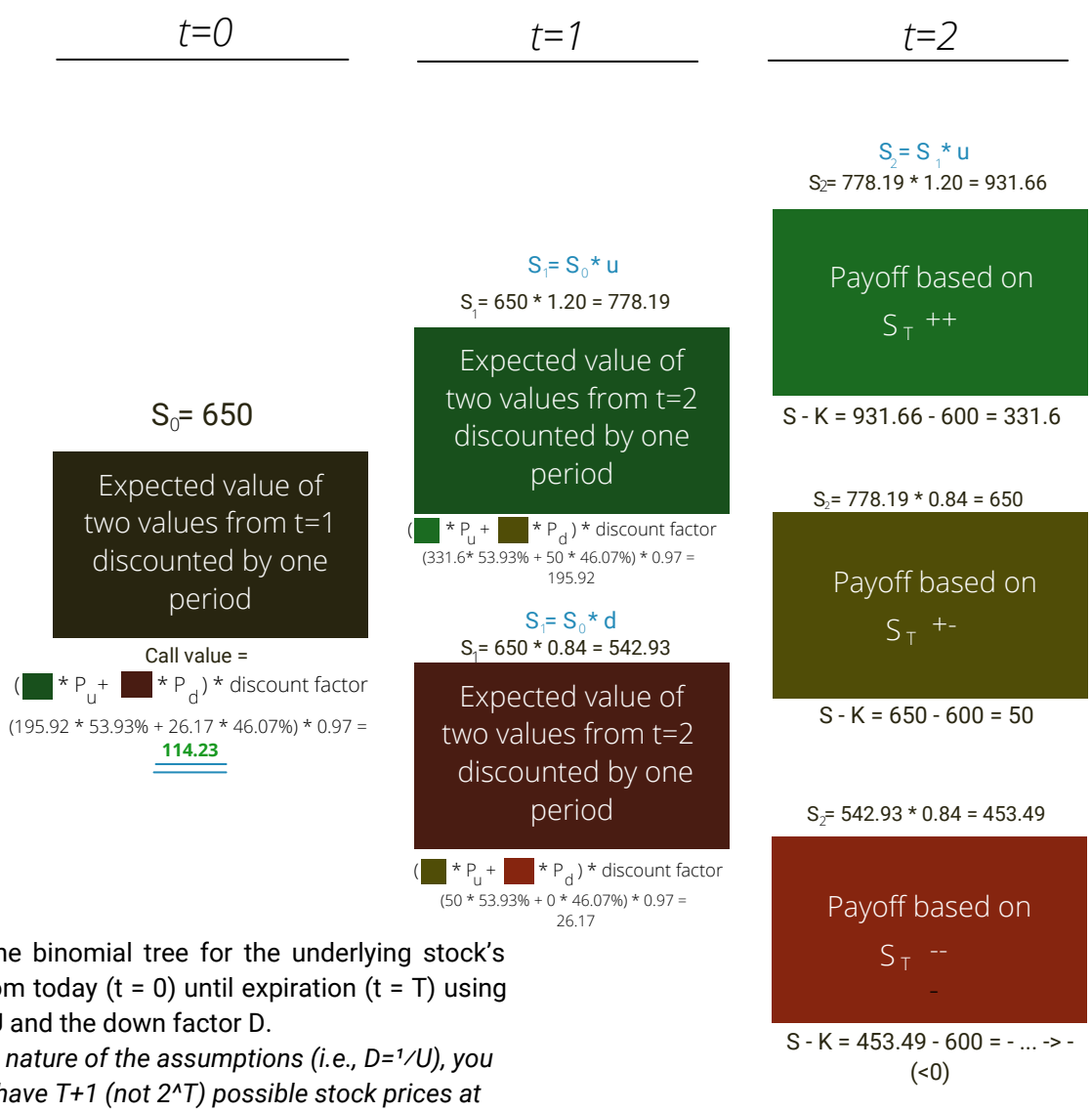
Assumptions

Stock Price today = **650$**
Annual risk-free rate = **3%**
Continuously compounded annualized up and down return = **18%**
Annual risk-free rate = **3%**
Strike Price = **600 $**

Calculations

- Annual up factor (u) = $e^{\text{growth rate}} = e^{18\%} = 1.20x$
- Annual down factor (d) = 1/u = 1/1.20 = 0.84x
- Annual discount factor = $e^{-r_f} = e^{-3\%} = 0.97$
- Up probability = $(e^{r_f} - d) / (u-d) = (e^{3\%} - 1.20) / (1.20 - 0.84) = 53.93\%$
- Down probability = 1- up probability = 46.07%



1. Calculate the binomial tree for the underlying stock's share price from today (t = 0) until expiration (t = T) using the up factor U and the down factor D.

NB! Given the nature of the assumptions (i.e., D=¹⁄U), you should only have T+1 (not 2^T) possible stock prices at time t=T.

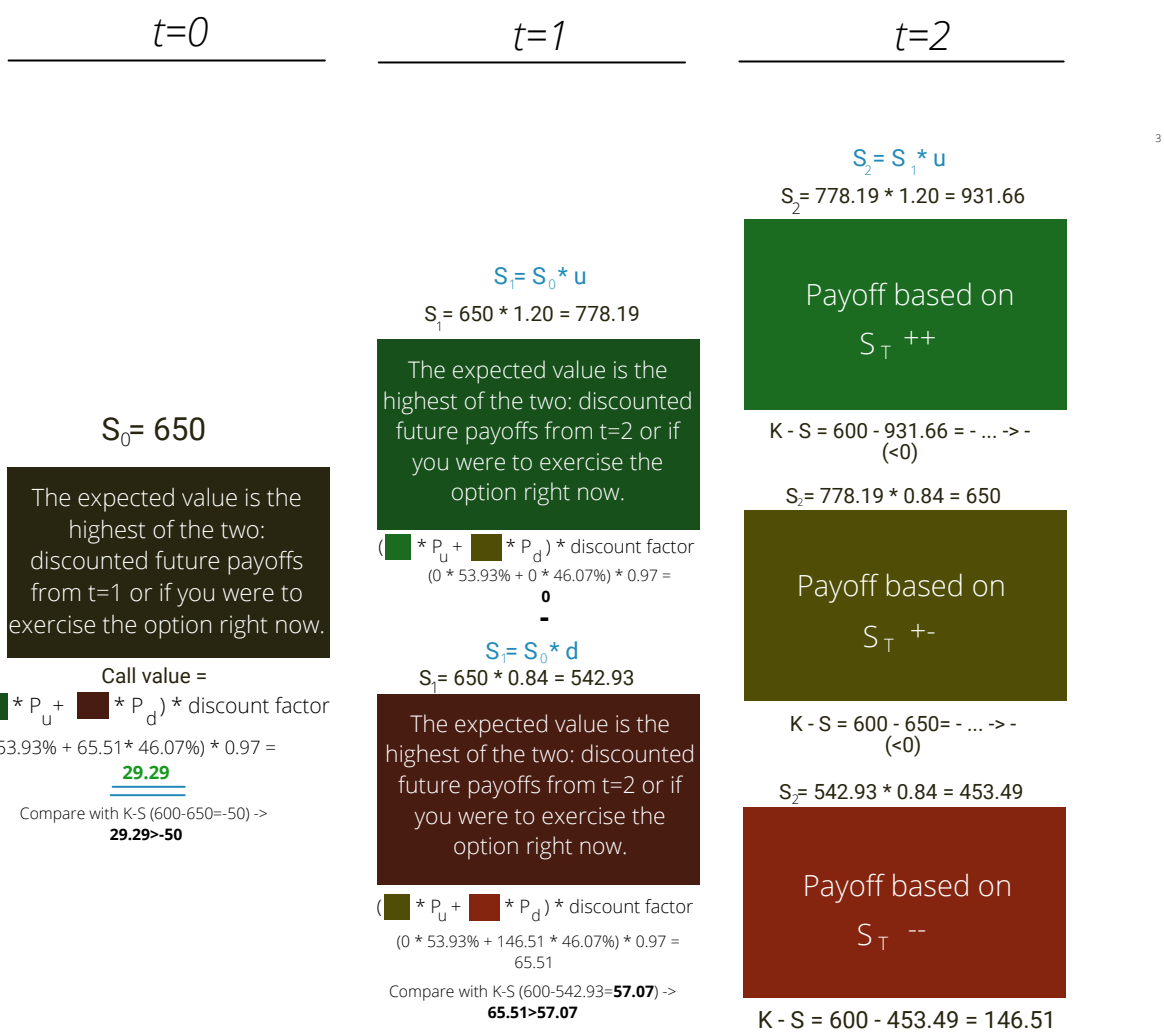
2. At t=T, compute all the possible payoffs of the option for all potential share prices at expiration based on the strike price and the nature of the option (i.e., call, put, etc.).

3. Calculate the expected option payoff at t=T using the risk-neutral up and down probabilities. Then, discount these expected payoffs using the risk-free rate (r_f) to find the option value at t=T-1 (i.e., one period prior to expiration). This value is called the continuation value of the option at time t=T-1.

NB! These risk-neutral up and down probabilities are NOT the market consensus probabilities that the stock will go up or down.

4. Repeat step 3 for times t=T-2,T-3,... until you find the value of the option at t=0. This should be the fair price of the option according to the binomial tree model.

EXAMPLE - AMERICAN PUT OPTION (same assumptions)



1. Calculate the binomial tree for the underlying stock's share price from today (t = 0) until expiration (t = T) using the up factor U and the down factor D.

NB! Given the nature of the assumptions (i.e., D=1/U), you should only have T+1 (not 2^T) possible stock prices at time t=T.

2. At t=T, compute all the possible payoffs of the option for all potential share prices at expiration based on the strike price and the nature of the option (i.e., call, put, etc.).

3. Calculate the expected option payoff at t=T using the risk-neutral up and down probabilities. Then, discount these expected payoffs using the risk-free rate (r_f) to find the option value at t=T-1 (i.e., one period prior to expiration). This value is called the continuation value of the option at time t=T-1.

NB! These risk-neutral up and down probabilities are NOT the market consensus probabilities that the stock will go up or down.

4. For American options, as they can be exercised at any time, first calculate the expected value at t=T by discounting future payoffs (step 3) and compare this value with stock minus exercise price (as if you were to exercise the option at this time). Continue further calculations with the **highest** number from these two.

5. Repeat step 3 and 4 for times t=T-2, T-3,... until you find the value of the option at t=0. This should be the fair price of the option according to the binomial tree model.

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#7

Top 5 Excel Features

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Financial Modeling in Excel

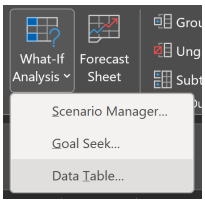
5 Excel **features** you should know

FINANCIAL MODELING WORLD CUP

Data Table

A great tool for your what-if analysis. A range of cells in which you can change values in some of the cells and come up with different answers to a problem.

How to create it?

Instructions	Example
1. Write down input data	Interest rate, number of periods and starting amount if you want to see how your savings amount would differ under different scenarios
2. Calculate the value you want to find out	Savings amount from the initial input data
3. Write down additional input data you want to test	Changes in interest rate, starting amount
4. Go to Data -> What-If Analysis -> Data Table	
5. Put in row and column input cell that corressponds to the layout you have created in step #3 and press OK	Row input cell - interest rate from initial input data; Column input cell - starting amount from initial input data

Interest Rate	7%
Number of Periods	3
Starting Amount	$ 2,000

By changing the initial input data, your data table will update too!

	$6,430	5.50%	6.00%	6.50%	7.00%	7.50%	8.00%	8.50%
$	1,500	$ 4,752	$ 4,775	$4,799	$4,822	$ 4,846	$ 4,870	$ 4,893
$	1,600	$ 5,069	$ 5,094	$5,119	$5,144	$ 5,169	$ 5,194	$ 5,220
$	1,700	$ 5,386	$ 5,412	$5,439	$5,465	$ 5,492	$ 5,519	$ 5,546
$	1,800	$ 5,702	$ 5,730	$5,759	$5,787	$ 5,815	$ 5,844	$ 5,872
$	1,900	$ 6,019	$ 6,049	$6,079	$6,108	$ 6,138	$ 6,168	$ 6,198
$	2,000	$ 6,336	$ 6,367	$6,398	$6,430	$ 6,461	$ 6,493	$ 6,524
$	2,100	$ 6,653	$ 6,686	$6,718	$6,751	$ 6,784	$ 6,817	$ 6,851
$	2,200	$ 6,970	$ 7,004	$7,038	$7,073	$ 7,107	$ 7,142	$ 7,177
$	2,300	$ 7,286	$ 7,322	$7,358	$7,394	$ 7,430	$ 7,467	$ 7,503
$	2,400	$ 7,603	$ 7,641	$7,678	$7,716	$ 7,754	$ 7,791	$ 7,829
$	2,500	$ 7,920	$ 7,959	$7,998	$8,037	$ 8,077	$ 8,116	$ 8,156

Financial Modeling in Excel

5 Excel **features** you should know

FINANCIAL MODELING WORLD CUP

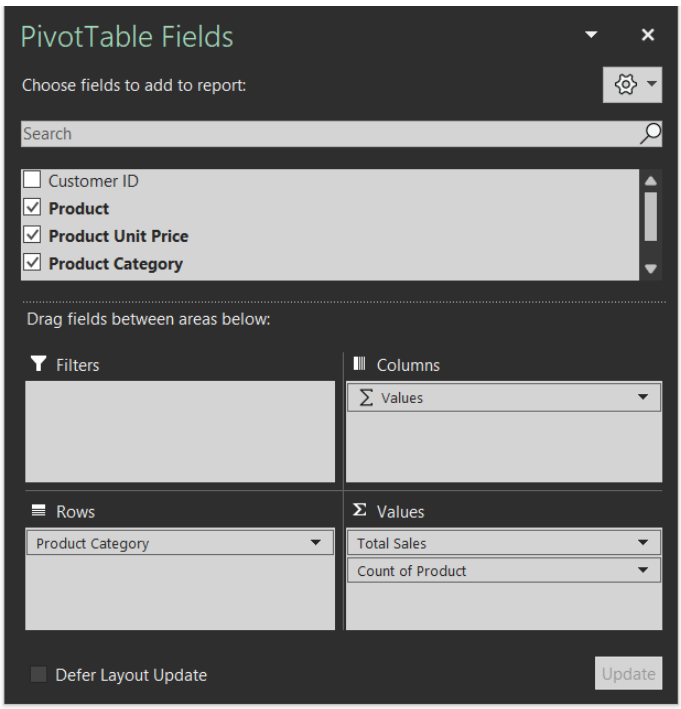
Pivot Table

A PivotTable is a powerful tool to calculate, summarize, and analyze data that lets you see comparisons, patterns, and trends in your data.

How to create it?

Instructions	Example
1. Have an Excel table with data	Store order history with customed ID, product ID, product price and product category
2. Go to Insert -> PivotTable and choose a table or a range you want to analyze	Choose the table from step 1
3. Choose fields to summarize the data by	Look at the total sales and count of products bought by product categories. Choose columns, Rows, Filters, Values – everything is customizable and you can play with the report!
4. Go to PivotTable Analyze or Design tabs to customize the Pivot Table	Add a slicer, insert timeline, add subtotals and other things

Summarized Data		
Product Category	**Total Sales**	**Count of Product**
Clothing	$ 687	3
Furniture	$ 845	6
Home & Garden	$ 319	4
Pet Supplies	$ 174	2
Grand Total	**$ 2,025**	**15**



Financial Modeling in Excel

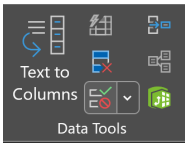
5 Excel **features** you should know

FINANCIAL MODELING WORLD CUP

Data Validation

Use data validation to restrict the type of data or the values that users enter into a cell. One of the most common data validation uses is to create a drop-down list.

How to create it?

Instructions	Example
1. Select the cell you want to create a drop-down list in	On your input data Excel sheet, create a cell where users will be able to choose between different store locations
2. Select Data -> Data Validation	
3. Choose what will the users be able to choose (numbers, dates, time, custom text, etc.)	Offer to choose from a list of store locations such as "USA, Spain, UK, Australia, Japan, Germany"
4. Create Input Message so that users know what they are choosing	"Select Store Location"
5. Link other data in your model to this dropdown list, so that values update automatically	Link profit and loss statements to geographical location of the stores from the dropdown by using "IF" statements

Store	USA		Year	2021
		USA Spain UK Australia Japan Germany		

P&L Projections						USA	2021
Sales	[$]	**78,000,000**	**88,627,500**	**93,783,659**	**95,774,992**	**102,351,736**	**109,838,853**
Domestic Sales	[$]	70,000,000	72,467,500	75,021,979	77,666,504	80,404,248	83,238,498
Foreign Sales	[$]	8,000,000	16,160,000	18,761,679	18,108,488	21,947,487	26,600,355
Manufacturing Costs	[$]	**56,500,000**	**63,240,000**	**66,585,600**	**67,917,312**	**72,211,366**	**77,140,835**
Materials	[$]	20,900,000	23,449,800	24,709,500	25,203,690	26,823,333	28,684,191
Direct Labor	[$]	25,300,000	28,386,600	29,911,500	30,509,730	32,470,350	34,722,968
Other Direct Costs	[$]	8,800,000	9,873,600	10,404,000	10,612,080	11,294,035	12,077,554
Indirect Manufacturing Costs	[$]	1,500,000	1,530,000	1,560,600	1,591,812	1,623,648	1,656,121
Gross Profit	[$]	**21,500,000**	**25,387,500**	**27,198,059**	**27,857,680**	**30,140,369**	**32,698,018**
SG&A Costs	[$]	**7,560,000**	**7,892,550**	**8,118,073**	**8,282,748**	**8,541,628**	**8,821,262**
Marketing Costs	[$]	1,560,000	1,772,550	1,875,673	1,915,500	2,047,035	2,196,777

Financial Modeling in Excel

5 Excel **features** you should know

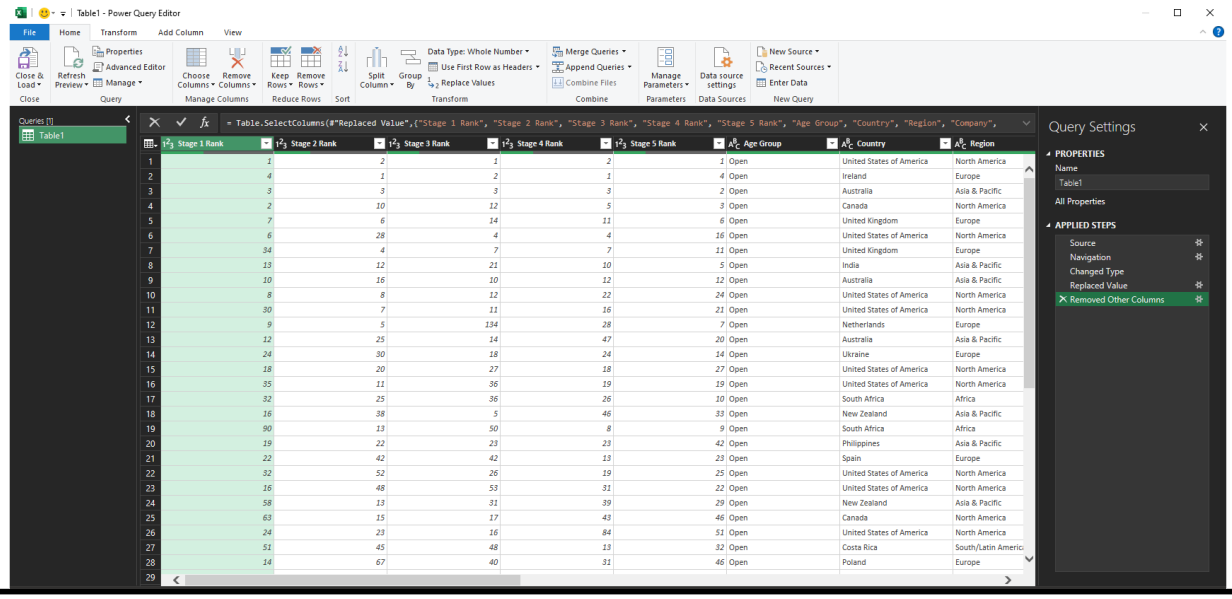
FINANCIAL MODELING WORLD CUP

Power Query

Power Query (known as Get & Transform in Excel) is a great tool for minimizing repetitive daily tasks. You can import or connect to external data and then shape this data. For example, remove a column, change a data type, or merge tables in ways that meet your needs. Then, you can load your query into Excel to create charts and reports.

How to create it?

Instructions	Example
1. Connect to Data Go to Data -> Get Data	Pull in data from a different Excel file that contains participant names and stage points
2. Transform Data Do all kinds of changes to your data while the original dataset stays the same	Clean Data - remove unneeded columns, assign data types, rename columns for better understanding, etc.
3. Combine Data Add other datasets and make connections between them to get more insights	Pull in another data source on the background of the participants - country, company, age group, etc. Append Queries.
4. Load Data Load the transformed and combined data to your worksheet and enjoy the clean dataset	Load the appended query into the Excel file. After each stage, add information on the points and refresh dataset.



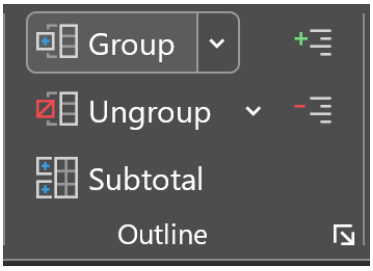
Financial Modeling in Excel

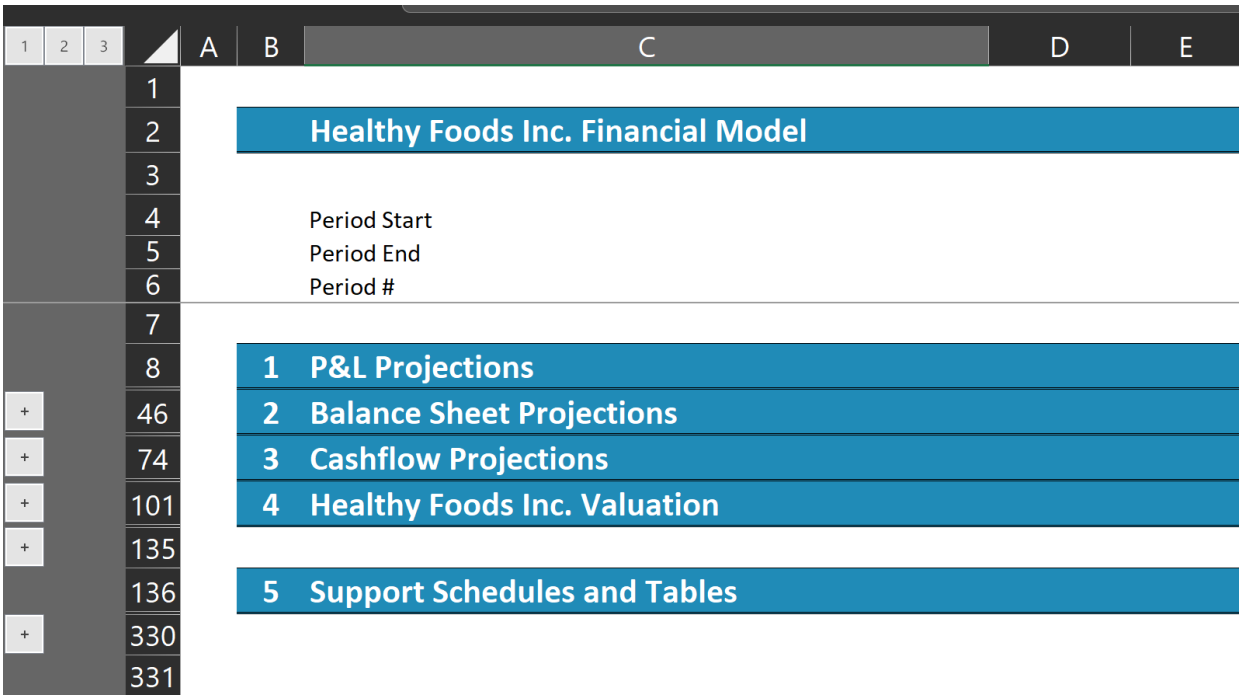
5 Excel **features** you should know

Group Data

If you have a list of data you want to group and summarize, you can create an outline of up to eight levels. Very important for financial models to switch between different levels of data complexity. Group data instead of hiding rows/columns!

How to do it (right)?

Instructions	Example
1. Select rows/columns to group	Level 1 – for top level management, Level 3 or 4 – for accountant in-depth data review
2. Go to Data -> Group -> Group	
3. Group again, if you want to go into more detail	
4. Press "-" to collapse the groups	



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#8 Conditional Formatting Guide

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Conditional Formatting

What type should you use?

General Usage

Use this feature to highlight values in specific cells

Examples

- Highlight all numbers that are higher than 70$ (e.g. average sales value)
- Highlight duplicate values in a table if you don't want to remove them
- Highlight text that contains necessary information (e.g. all cells that contain "sold")
- Highlight all number values that are equal to a specific number (e.g. product ID number)

Sales Value by Employee by Date						
Date	Jim	Kanye	Laura	Tim	Simon	Elsa
8/22/2022	$ 90.00	$ 114.00	$ 85.00	$ 64.00	$ 45.00	$ 59.00
8/23/2022	$ 47.00	$ 89.00	$ 34.00	$ 62.00	$ 117.00	$ 110.00
8/24/2022	$ 106.00	$ 30.00	$ 59.00	$ 79.00	$ 68.00	$ 103.00
8/25/2022	$ 68.00	$ 87.00	$ 103.00	$ 34.00	$ 36.00	$ 93.00
8/26/2022	$ 41.00	$ 72.00	$ 36.00	$ 92.00	$ 107.00	$ 109.00

Conditional Formatting

What type should you use?

General Usage

Use this feature to highlight values in specific cells.

Examples

- Highlight top 10 sales in a week
- Highlight top 10 stores generating the most sales
- Highlight all employee KPI values that are above average
- Highlight top 20% products bringing in the most sales

Sales Value by Employee by Date						
Date	Jim	Kanye	Laura	Tim	Simon	Elsa
8/22/2022	$ 82.00	$ 44.00	$ 67.00	$ 74.00	$ 67.00	$ 46.00
8/23/2022	$ 115.00	$ 97.00	$ 62.00	$ 91.00	$ 60.00	$ 96.00
8/24/2022	$ 63.00	$ 65.00	$ 32.00	$ 87.00	$ 55.00	$ 113.00
8/25/2022	$ 87.00	$ 43.00	$ 81.00	$ 109.00	$ 111.00	$ 89.00
8/26/2022	$ 99.00	$ 42.00	$ 58.00	$ 111.00	$ 119.00	$ 71.00

Conditional Formatting

What type should you use?

General Usage

Use this feature to highlight the relationship of values in a cell range. Extends a band of color across the cell.

Examples

- Compare prices between different stores
- Compare total points scored
- Compare user count

	Points Scored
Gavin	61
Nate	88
Laura	90
Simon	87
Linda	38

Conditional Formatting

What type should you use?

General Usage

The relationship of values in a cell range. Applies a color scale where the intensity of the cell's color reflects the value's placement toward the top or bottom of the range.

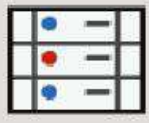
Examples

- Compare sales across regions
- use in your what if analysis (compare project IRR at different discount rates and future cashflows)
- Compare profits between different months

	Sales	
New York	$	65,785
Detroit	$	40,989
Washington D.C.	$	39,089
New Mexico	$	72,909
Los Angeles	$	77,454

Conditional Formatting

What type should you use?



Icon Sets

General Usage

A cell range that contains three to five groups of values, where each group has its own threshold.

Examples

- Visualize product ratings (star icons)
- Highlight sales data that are above and below a certain number (up and down icons)
- Highlight changes in data from previous periods
- Show levels cleared in Excel Esports battles!

EDUARDO GONZÁLEZ

HARRY GROSS

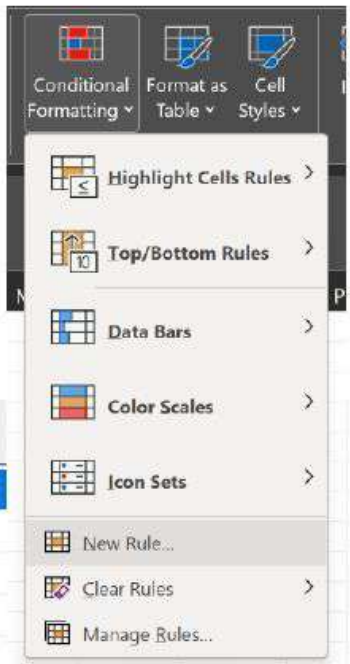
Sales	2021	2022	
Jan	$ 6,718	$ 6,686	↓ $ (33)
Feb	$ 7,038	$ 7,004	↓ $ (34)
Mar	$ 7,358	$ 7,430	↑ $ 72
Apr	$ 7,678	$ 7,754	↑ $ 75
May	$ 7,998	$ 8,077	↑ $ 79

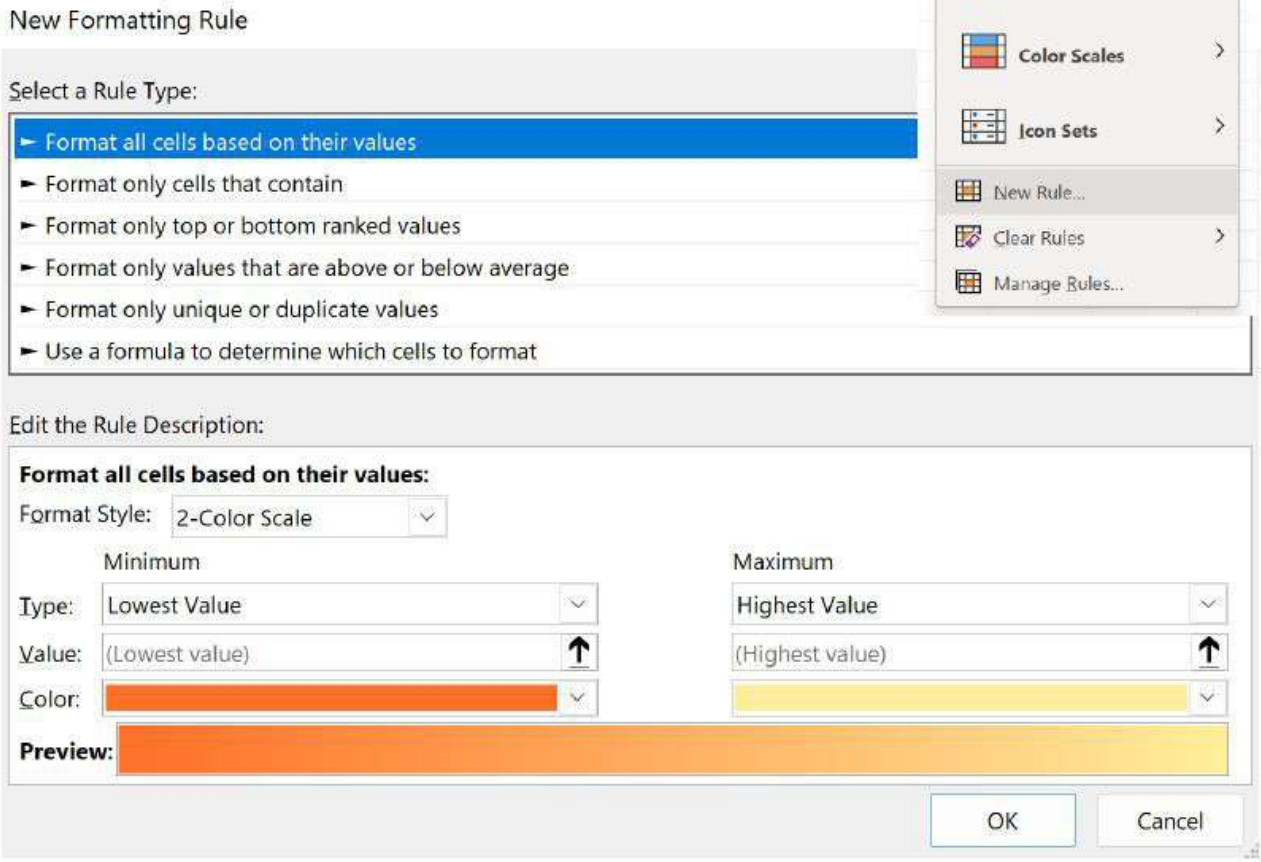
Conditional Formatting

What type should you use?

Or...

Create your own rules!





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#9 Typical Excel Mistakes

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Not using the correct data format

It's important to use the correct data type for each column in your spreadsheet, such as text, number, or date. Incorrect data types can result in unexpected errors and formatting issues.

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Not using error-checking functions

Excel has several built-in error-checking functions, such as IFERROR, that can help you avoid common errors and provide more informative error messages.

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Not using data validation

Data validation is a powerful tool that can help you ensure that data entered into your spreadsheet meets certain criteria. For example, you can use data validation to restrict the type of data that can be entered into a cell, or to limit the range of acceptable values.

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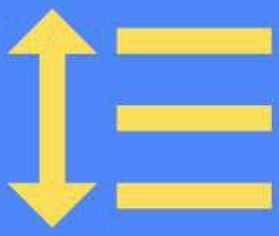

Not using conditional formatting

Conditional formatting is a great way to highlight cells that meet certain criteria, such as cells that contain values that are above or below a certain threshold.

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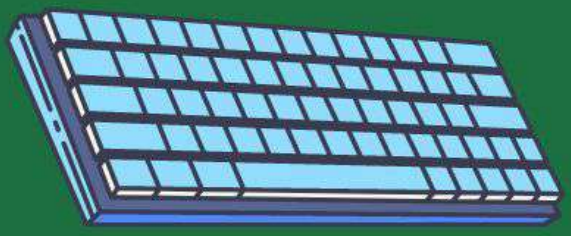

Not using keyboard shortcuts

Keyboard shortcuts can save you a lot of time when working with Excel. For example, you can use the Shift + Spacebar shortcut to select the row, Ctrl+- (plus minus) to delete the row and Ctrl + Shift + "+" to add a row.

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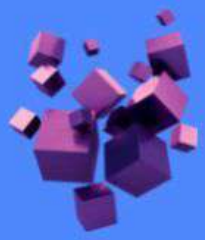

Not using named ranges

Named ranges make it easier to reference cells and ranges in your formulas and macros. By using named ranges, you can make your formulas more readable and easier to understand. It also speeds up your work. Important when competing at Excel Esports tournaments!

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