Slide 1: Excel Examples

* So, I’ll start with a presentation that showcases some of the projects I’ve worked on excel, the skills I’ve used and how this carries well over to the technical requirements of the research analyst ITFM role

Slide 2: Table of Contents & Excel skills

* I’ll be covering 3 main areas: the first will be a cash flow analysis project I did for a course called simulation and risk at Ivey Business School – this project will cover excel formulas norm.inv(), vlookup, and npv
* The second will cover some useful charts for ITFM, especially related to benchmarking activities like the bullet chart, and the combo chart with columns and line
* Lastly, I will cover a dynamic dashboard I made for a self-learning project, this dashboard will highlight my ability to use pivot tables and slicers to visualize data dynamically and drill down when necessary

Slide 3: Cash Flow Analysis: Green Inc Development Project

* This project was basically about a company which wanted to know if they should invest in a project, we had some assumptions to start with
* Here I’d like to pause for a second and lay out my approach, for brevity's sake, I was thinking of just giving a high-level overview of the assumptions but if you want, I can go into more detail and explain these assumptions on a granular level
* As a high-level overview, assumptions like year 1 demand forecast, service level of 85% affects our actual production, similarly inflation rate with mean of 5% and standard deviation of 2% will affect our prices and costs of production from year 2 onwards – these assumptions will ultimately affect our profit levels for the next 10 years
* And the discount rate, in the second row, will be an input for calculating the npv towards the end

Slide 4: Overview of the Analysis

* This slide shows a snapshot of the cash flow analysis model I built on excel to understand whether this project is attractive
* The first section, which shows a table calculating the cash flows for the next 10 years helps us get to the npv value
* The second section covers a monte carlo simulation to assess the overall risk of the project keeping in mind the NPV values corresponding to different probability levels
* And then the third and last section of the project will visualize the cumulative distribution of NPV, basically it will help us understand how likely it is this project will be attractive

Slide 5: Breaking down Cash flows and NPV

* Let’s start with the first section, breaking down cashflows and npv

Slide 6: Calculating Cash flows, I

* The first two tables just show the assumptions we’ve already covered, as mentioned these values will help us calculate the initial investment, the R&D cost and the profits for the next 10 years
* Just to give you an example of one of the calculations, I used norm.inv(rand(), 2200, which is the mean of the R&D, 300, st deviation of the R&D) to get the R&D cost, the initial investment of 1824.
* So, in this way, I came up with all the other values to ultimately get the profit level
* Both the profit and R&D cost are highlighted in bold.

Slide 7: Calculating Cash flows II

* Here the first two tables are just a continuation of the last table, calculating the profit/ cash flows for the next years
* The only addition in the calculation from year 2 onwards is accounting for the inflation rate for the price and cost levels
* Once I calculated the profits for the next years, I used the NPV formula in excel, which uses the discount rate and all cash flows as inputs) and then subtracted the R&D cost to get a value of $113.48 meaning the company will only be making an additional 113.48 dollars.
* Since this is just one possible scenario, I had to simulate this over many runs with different probabilities to get a clearer picture of the overall risk and return of the project and this is where a monte carlo simulation came in handy

Slide 8: Monte Carlo Simulation

* This just shows a snapshot of the monte carlo simulation, on the left you can see the cumulative probabilities which go from 0 all the way to 1 and their corresponding NPV values which are shown in red because they’re negative
* But as they get positive lower down, at around the 15% cumulative probability level, they are shown in green.
* Which explains why the average NPV value is around 673 dollars, shown in green

Slide 9: Monte Carlo Simulation

Why was Monte Carlo used?

A Monte Carlo simulation was used to understand the range of possible outcomes for the project's NPV, taking into account the uncertainty and variability in key assumptions (like demand, costs, and prices). Instead of relying on a single "best guess" scenario, the Monte Carlo simulation allows you to see a distribution of potential outcomes, showing how likely different NPV values are. This helps in assessing the risk and determining whether the project is worth pursuing.

How can I use Monte Carlo simulation at my work in Info-Tech?

### **Application at Info-Tech**

In the context of Info-Tech, you might use Monte Carlo simulations to:

* Assess the financial viability of IT projects under different scenarios.
* Understand the risks and potential outcomes associated with varying IT budget allocations.
* Perform benchmarking exercises where you simulate various scenarios to predict outcomes like cost savings, return on investment, or project timelines.

For example, when benchmarking IT spending across different departments or forecasting the financial impact of IT investments, Monte Carlo simulations can model various scenarios to understand potential outcomes and their likelihood. This can help in making more informed decisions by quantifying risks and identifying the scenarios where an investment or a decision might not pay off, thus enabling better risk management and strategic planning

For example, our client has an IT budget of 10 million and it’s spread over 5 different departments: security, infrastructure, operations and support, and each department has certain standard deviations associated with its budget based on historical data (to account for the uncertainty in costs), they want to know the likelihood of staying within the budget so to assess this likelihood you will run a monte carlo simulation by calculating the actual total spend and simulating this for 1000 times, then taking the average and understanding the likelihood of staying within the budget for example we can find that 80% of the time we will overshoot the budget by 600,000.

How was Monte Carlo simulation done on excel?

* First, you choose an empty column and fill it with values from 1 to 1000
* Then you choose an empty cell at the top and reference it to the npv value you calculated
* Then you choose both these columns, go to what if analysis and select data table
* Once data table is open, just select an empty cell for the column and the NPV values will be calculated 1000 times
* Since sorting values within a data table is complicated and messy, I copied these NPV figures and pasted them as statitc values in another column
* Then I sorted these NPV values from smallest to largest
* To calculate the corresponding cumulative probabilities, I simply divided the rank of the NPV value from the total number of simulations, so for example the cumulative probability of the second smallest NPV figure was calculated as 1/1000 = 0.001
* This way, NPV values and their corresponding NPV values were calculated
* One interesting thing to note is that even though the average NPV across 1000 scenarios comes out to be positive, the standard deviation is also quite high which means that this project is also quite risky as there is a lot of variation present
* I also created a small table that helps understand the NPV at the 25th, 50th, and 75th percentile using lookup

Slide 10 and 11: Cumulative distribution of NPV

* Visual representation of the range of NPV and its likelihood
* I chose a scatter plot with smooth lines to show the relationship between NPV and cumulative probabilities
* So, for example, there is around a 15% chance that the npv of this project will be negative and an 85% chance that it will be positive with majority of the npv falling between 500 to 1500 dollars
* **Financial Impact Assessment**:
* **Relevance**: Just as in your cash flow analysis, where you calculated the Net Present Value (NPV) of a development project, a Research Analyst in IT Financial Management (ITFM) would perform similar analyses to assess the financial impact of IT investments or projects.
* **Example**: Suppose a company is considering investing in a new IT infrastructure project. The Research Analyst would use cash flow analysis to project the costs and benefits over time, discounting future cash flows to present value, just as you did in your project. This helps the company decide whether the project is financially viable.
* **Risk Analysis**:
* **Relevance**: Your Monte Carlo simulation provided a range of possible NPVs, helping you understand the risk and uncertainty associated with the project. In ITFM, similar techniques can be used to analyze the financial risks of IT projects or budget decisions.
* **Example**: When forecasting the potential costs of a large-scale IT upgrade, the analyst might use Monte Carlo simulations to model different cost scenarios (e.g., variations in hardware prices, labor costs, etc.). This would provide a distribution of possible outcomes, helping the company prepare for best and worst-case scenarios.

Slide 12: Useful charts for ITFM benchmarking

* Now I’ll be covering some charts and visualizations which I believe can be particularly insightful when it comes to benchmarking and comparing your clients kpis against industry averages
* These visualizations include bullet charts and combo charts (column & line)

Slide 13: Bullet chart

* Starting with the bullet chart, I feel like this chart is ideal for benchmarking because it allows for the easiest interpretation of comparing different metrics or in this case, comparing the sales performance of the current year against historical data for past 5 years across different product categories
* So, for example, we can see that that tables and machines fell short whereas chairs and phones outperformed historical sales
* This could provide further analysis by helping us understand where to look, if tables have lagged, why has that happened?

### **Example: Benchmarking IT Department Spending**

**Scenario**: Let's say you are benchmarking the IT spending of different departments within a company. You have budgeted amounts for various IT categories (e.g., software, hardware, cloud services, etc.) based on historical data or industry standards. Now, at the end of the fiscal year, you want to compare the actual spending with these benchmarks to identify where the company is overspending or underspending.

**Using a Bullet Chart**:

* **Budgeted Spending (Benchmark)**: The gray bars in the bullet chart represent the budgeted or historical average spending for each IT category.
* **Actual Spending**: The colored bars (green for over-performance, red for under-performance) show the actual spending by each department in the current year.

### **How It Works:**

1. **Visualizing Overspending**:
   * In the bullet chart, if a green bar extends significantly beyond the gray bar, it indicates that the department has spent more than the budgeted amount on that particular IT category. For example, if the "Software" category's green bar is longer than the gray bar, it signals overspending.
2. **Identifying Underspending**:
   * Conversely, if the red bar is shorter than the gray bar, it indicates underspending. For example, if the "Cloud Services" category's red bar is shorter than the gray bar, it suggests that the department did not use the full budget allocated for cloud services.
3. **Benchmarking for Efficiency**:
   * By comparing the actual spending with the budgeted benchmarks across different IT categories and departments, the company can quickly identify where it might need to investigate further. For example, consistent overspending in "Hardware" might prompt a deeper analysis into procurement practices, while underspending in "Training" could signal a need to reassess priorities.

Slide 14: Combo chart (Column & Line)

* A combo chart is another visualization helpful for benchmarking because it allows for comparing two metrics across time
* In this chart, we are comparing sales, represented as columns and the order amount, shown as the black line across time, which gives insights into seasonal variation where we can see that business picks up from Jan 2016 to Jan 2018 but then fell off

Combo charts in ITFM  
**Scenario**: Suppose you are responsible for tracking the IT budget across multiple departments within an organization. You want to compare how well each department is sticking to its budget and how efficiently projects are being delivered. The goal is to identify whether there is a correlation between budget utilization and project delivery efficiency.

**Using a Combo Chart**:

* **Columns for IT Spending**: The columns in the combo chart could represent the monthly IT spending of a department. For example, each column shows how much of the IT budget was spent each month.
* **Line for Project Delivery Timelines**: The line in the combo chart could represent the average timeline for project completion in the same department. For example, it might show how long, on average, it took to deliver IT projects each month.

### **How It Works:**

1. **Visualizing Correlation**:
   * If you observe that when IT spending increases, the project delivery timelines also improve (i.e., projects are completed faster), this might indicate that the department is using its budget effectively to accelerate project delivery.
   * Conversely, if increased spending does not correlate with improved delivery timelines, this might suggest inefficiencies—perhaps money is being spent but not translating into faster or better project outcomes.
2. **Identifying Trends**:
   * The combo chart can help you identify trends, such as certain months where spending spikes lead to quicker project completions, or periods where despite high spending, projects still face delays.
   * For instance, if in Q4 spending consistently rises but project timelines remain long, this could indicate a recurring issue that needs to be addressed, such as poor planning or resource allocation.
3. **Benchmarking Across Departments**:
   * By using similar combo charts for different departments, you can benchmark their performance against each other. For example, if Department A consistently spends within its budget and delivers projects on time, while Department B spends more and still faces delays, this insight could lead to best practices from Department A being applied across the organization.

Slide 14: Dynamic dashboard with pivot table

* Here I made a dynamic dashboard taking data from a pivot table, this table has data on the sales performance of different regions and then to make it dynamic i added slicers on product category and timeline slicers showing quarterly values

### Dynamic dashboards in ITFM: **Example: Capital vs. Operational Expenses Analysis**

**Scenario**: Imagine you're responsible for analyzing and reporting on the IT spending of a company, particularly focusing on the breakdown between Capital Expenses (CapEx) and Operational Expenses (OpEx). The goal is to understand the allocation of resources between long-term investments (CapEx) and day-to-day operational costs (OpEx) and to identify trends, inefficiencies, or opportunities for reallocation.

### **Using the Dynamic Dashboard:**

1. **Pivot Table**:
   * The pivot table could summarize IT spending across different departments (e.g., Infrastructure, Software Development, IT Support) and categorize it into CapEx and OpEx.
   * For instance, rows could represent different departments, columns could represent the expense categories (CapEx, OpEx), and values could show the amounts spent.
2. **Bar Chart**:
   * The bar chart could visualize the data from the pivot table, showing a side-by-side comparison of CapEx and OpEx for each department.
   * For example, blue bars could represent CapEx, and orange bars could represent OpEx. This comparison helps to see how resources are allocated between long-term investments and operational costs across the organization.
3. **Slicers**:
   * Slicers could be used to filter the data dynamically by department, project type, or time period.
   * For example, you could use a slicer to filter by specific departments, such as Infrastructure or Software Development, and another slicer to filter by fiscal quarters or years. This allows for detailed analysis of where the company is focusing its capital investments versus operational spending over time.

### **How It Works in ITFM:**

* **Monitoring CapEx vs. OpEx Balance**:
  + The dashboard helps in monitoring the balance between CapEx and OpEx across departments. For instance, if a particular department like Infrastructure is showing higher CapEx compared to OpEx, it might indicate a focus on long-term investments such as new data centers or equipment.
  + Conversely, if Software Development shows higher OpEx, it might reflect ongoing operational costs like software licenses, maintenance, and staff salaries.
* **Benchmarking and Best Practices**:
  + The dashboard could be used to benchmark CapEx and OpEx against industry standards or historical data. For example, if your company's CapEx as a percentage of total IT spending is lower than industry benchmarks, it might suggest an underinvestment in long-term assets that could affect future growth or efficiency.

**Financial ratios**

In the context of IT Financial Management (ITFM), there are several key financial ratios that can help you assess the financial health, efficiency, and performance of an IT department or organization. Here’s a list of important ratios, along with examples to help you understand their relevance:

**1. Return on Investment (ROI)**

Formula: ROI= Net Profit/Cost of Investment×100

ROI=Cost of InvestmentNet Profit ×100

Example: If a company invests $500,000 in a new IT infrastructure and expects to generate $700,000 in additional revenue, the ROI would be:

ROI=700,000−500,000/500,000×100=40%

Relevance: This ratio helps to evaluate the efficiency of an investment and its profitability.

**2. Cost-Benefit Ratio (CBR)**

Formula: CBR=Total Benefits/Total Costs

Example: If implementing a new software system costs $200,000 but is expected to generate $500,000 in savings, the CBR would be:

CBR=500,000200,000=2.5CBR=200,000500,000 =2.5

Relevance: This ratio helps in determining whether the benefits of a project or investment outweigh its costs.

**3. Capital Expenditure (CapEx) to Operating Expense (OpEx) Ratio**

Formula: CapEx to OpEx Ratio=Capital Expenditures/Operating Expenses

Example: If a company spends $1 million on capital expenditures and $3 million on operating expenses, the ratio would be:

CapEx to OpEx Ratio=1,000,000/3,000,000=0.33CapEx to OpEx Ratio=3,000,0001,000,000 =0.33

Relevance: This ratio helps to understand the balance between spending on long-term investments versus day-to-day operations. A higher ratio might indicate a focus on growth and innovation, while a lower ratio could signal a focus on maintaining current operations.

**4. IT Spending as a Percentage of Revenue**

Formula: IT Spending as % of Revenue=Total IT SpendingTotal Revenue×100

Example: If a company’s total IT spending is $5 million and its total revenue is $100 million, the ratio would be:

IT Spending as % of Revenue=5,000,000100,000,000×100=5%IT Spending as % of Revenue=100,000,0005,000,000 ×100=5%

Relevance: This ratio helps to assess how much of the company's revenue is allocated to IT. It is a key metric for benchmarking against industry standards.

**5. Cost per Employee**

Formula: Cost per User=Total IT Costs/Number of Users or Employees

Example: If the total IT costs are $10 million and the company has 2,000 employees, the cost per user would be:

Cost per User=10,000,0002,000=5,000Cost per User=2,00010,000,000 =5,000 per user

Relevance: This metric helps to measure IT cost efficiency by determining how much is spent on IT per employee or user.

**6. IT Asset Turnover Ratio**

Formula: IT Asset Turnover=Total Revenue/Total IT Assets

Example: If a company’s total revenue is $50 million and its IT assets are valued at $10 million, the IT Asset Turnover Ratio would be:

IT Asset Turnover=50,000,00010,000,000=5IT Asset Turnover=10,000,00050,000,000 =5

Relevance: This ratio shows how efficiently IT assets are being used to generate revenue. A higher ratio indicates better utilization of IT investments.

**7. Operating Expense Ratio (OER)**

Formula: OER=Operating Expenses/Total Revenue×100

Example: If a company’s operating expenses are $8 million and its total revenue is $20 million, the OER would be:

OER=8,000,00020,000,000×100=40%OER=20,000,0008,000,000 ×100=40%

Relevance: This ratio is crucial for understanding how much of the company’s revenue is consumed by operating expenses. In ITFM, it can help assess the efficiency of operational spending.

**9. Payback Period**

Formula: Payback Period=Initial Investment/Annual Cash Inflow

Example: If a company invests $1 million in a new IT system and expects to save $250,000 annually, the payback period would be:

Payback Period=1,000,000250,000=4Payback Period=250,0001,000,000 =4 years

Relevance: The payback period measures how long it takes for an investment to generate enough cash flow to recover its cost. This is important for assessing the risk and return of IT investments.