

# Forecasting MasterClass

Tips and Techniques for Fine-Tuning  
Workload Predictions



# Meet the Panellists



Jonty Pearce, Call Centre Helper



Penny Reynolds, The Call Center School



Dean Couchman, injixo



Chris Dealy, injixo

# Session Overview

In this session, we'll discuss five tips and techniques for improving workload forecasts:

1. Forecasting models
2. Influence of trends, seasons, and cycles
3. Adjusting for historical data aberrations
4. Measuring forecast accuracy
5. Using the right tools

# Forecasting Models

- Point Estimation
- Averaging Approaches
- Time Series
- Regression Analysis

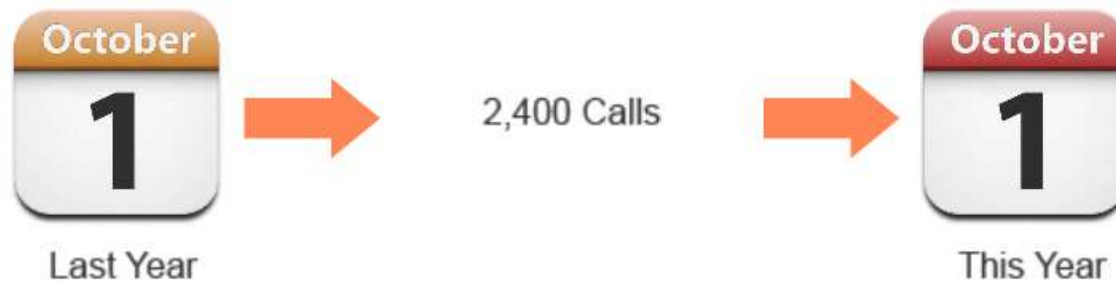


And a host of others...

# Point Estimation

## Shortcomings:

- Does not recognise recent trends
- Does not account for long-term change
- Cannot determine whether the data for the original point was typical or unusual



# Averaging Approaches

Simple Average:



Call Volume

Simple Average

Week 1:	90		
Week 2:	93		
Week 3:	95		
Week 4:	95		
Week 5:	98		
Total:	471	Divide by 5:	94.2

# Averaging Approaches

Moving Average:



Simple Average	94.2
Moving Average	96

Week 1: 90

Week 2: 93

Week 3: 95

Week 4: 95

Week 5: 98

Total: 288    Divide by 3: 96

# Averaging Approaches

Weighted Average:





# Averaging Approaches

- Simple average
- Moving average
- Weighted average
- Averaging approaches are generally **not** used for predicting **call volumes** in a changing call centre environment because you will never get “the next number” in the series.
- An averaging approach is appropriate for determining **the average handle time** to be used in workload calculations.



# Times Series Analysis

- The preferred method of forecasting call centre workload
- Identifies trends and isolates seasonality to better predict future workload



# Components of Time Series Analysis

## Primary Components

- Trend – Long-term rate of change in call volume (expressed as the average monthly increase or decrease)
- Seasonality – Month-to-month fluctuation in calls

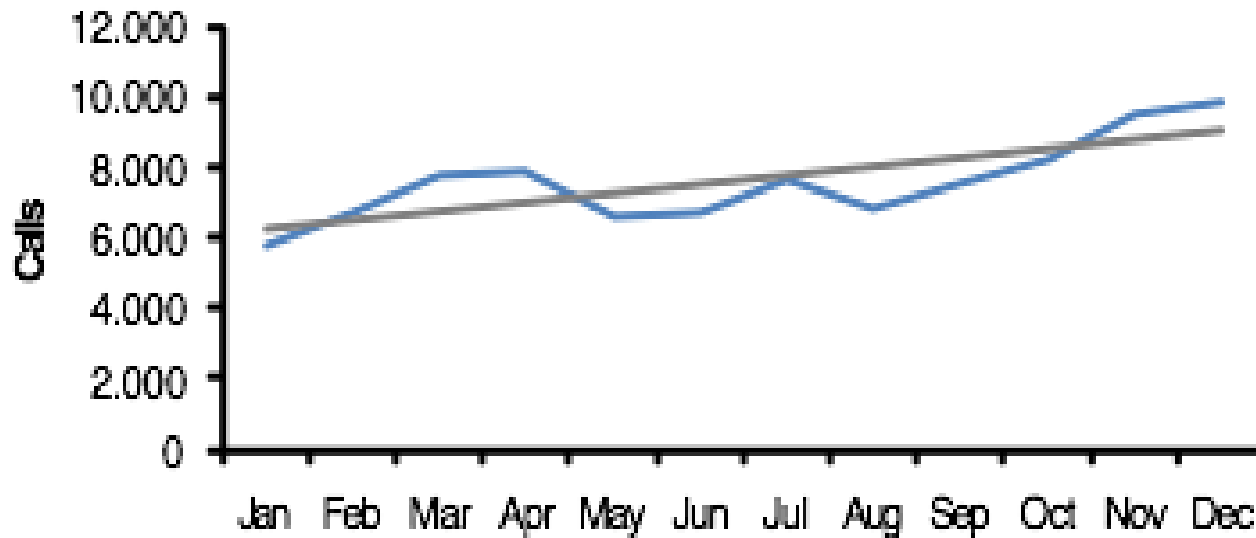
## Also...

- Cycles – Repeatable patterns primarily due to business influences



# Time Series Forecasting

Understand the influences of **trend** and **seasonality** and how to separate



The line through the data represents the average month with the trend as a steady growth factor

The difference between the line and the data represents the seasonality

# Adjusting Data for Aberrations

How do you identify aberrant data?

- Extremes may be indicators of aberrant data.
- Unusually flat pattern may also be an indicator of aberrant data.
- Some may be “normal” or “repeatable” aberrations.
- Others are “special” or unique aberrations.
- Some are just bad data.



# Adjusting Data for Aberrations

What should be done with aberrant data?

- Store “repeatable event” aberrant data for future use as predictor.
- Always note aberrations and cause on reports for future use.
- Normalise or discard aberrant data for normal historical reporting.

# Measuring Forecast Accuracy

## Goals of the Analysis

- Most accurate data used
  - Clean historical data
  - Full application of business drivers
- Best match of forecast with actual
  - Contact volume
  - AHT
  - Staffing calculation based on goals
- Serves as foundation of all that follows

# Calculating Forecast Accuracy

Three ways to measure accuracy:

- Percent Difference
- Standard Deviation
- Correlation Coefficients





# Calculating Percentage Difference

	Forecast Volume	Actual Volume	% Difference
Monday	3533	3601	-.019
Tuesday	2455	2544	-.036
Wednesday	2611	2723	-.043
Thursday	2990	3111	-.040
Friday	2935	3078	- .049
Saturday	1028	1103	- .073
Total	15,552	16,160	- .039

# Calculating Percentage Difference

	Forecast Volume	Actual Volume	% Difference
Monday	3533	3494	- .011
Tuesday	2455	3156	+ .286
Wednesday	2611	2854	+ .093
Thursday	2990	2647	- .115
Friday	2935	2301	- .216
Saturday	1028	993	- .034
Total	15,552	15,445	- .007

# Which is better?

	% Difference		% Difference
Monday	.019		- .011
Tuesday	.036		+ .286
Wednesday	.047		+ .093
Thursday	.040		- .115
Friday	.049		- .216
Saturday	.073		- .034
Total	.039		- .007

# Statistically Speaking

## Standard Deviation

is another way to evaluate variation.

# Calculating Standard Deviation in Excel

The screenshot shows an Excel spreadsheet with the following data:

	Forecast	Actual	Difference	% Difference
Monday	3533	3494	39	1%
Tuesday	2455	3156	-701	-29%
Wednesday	2611	2854	-243	-9%
Thursday	2990	2647	343	11%
Friday	2935	2301	634	22%
Saturday	1028	993	35	3%

The formula bar shows the formula: `=STDEV(E3:E8)`. An arrow points to the `STDEV` function in the formula bar with the text "Choose STDEV".

# Worksheet – Calculating Standard Deviation

	Forecast Volume	Actual Volume	% Difference
Monday	3533	3494	- 1 %
Tuesday	2455	3156	+ 29 %
Wednesday	2611	2854	+ 9 %
Thursday	2990	2647	- 11 %
Friday	2935	2301	- 22 %
Saturday	1028	993	- 3 %
Total	15,552	15,445	<1%
		Standard Dev =	17.53%

# Another Calculation of Forecast Accuracy

## Correlation Coefficients

A numerical value that identifies the strength of a relationship between variables.

*The higher the correlation coefficient, the better the match*

The correlation function in Excel is:

`CORREL(array1, array2)`

Where array1 and array2 are cell ranges of equal lengths.

# Using Excel

1. Enter the data in worksheet in columns or rows
2. Choose any open cell to perform the analysis
3. Go to arrow on right of “AutoSum” symbol
4. Select “more functions”
5. Choose “Correl” from the list
6. Select data from one month for Array 1 and the other month for Array 2 - Make sure the number of cells in Array 1 and 2 are equal
7. Click OK
8. Output is correlation coefficient – higher number = strong correlation
9. Correlation coefficient of 1.0 equals a perfect match





# Using Correlation Coefficients

	Week 1	Week 2	Correlation Coefficient
Monday	5500	1833	
Tuesday	5250	1750	
Wednesday	5200	1733	
Thursday	5100	1700	
Friday	5050	1683	
Saturday	2200	733	
Sunday	900	300	
Total	29,200	9733	1.0

# Using Correlation Coefficients

	Week 1	Week 2	Correlation Coefficient
Monday	5500	4200	
Tuesday	5250	4850	
Wednesday	5200	5200	
Thursday	5100	3600	
Friday	5050	5300	
Saturday	2200	4800	
Sunday	900	1250	
Total	29,200	29,200	0.68

# Some Thoughts on Forecast Accuracy

1. Do you trust the forecast?
  - Enough to stake a bonus payment based on accuracy results?
  - Enough to deny a vacation week to a hard-working agent?
2. Are your accuracy goals linked to size?
3. Are your accuracy goals different for high and low intervals?

# Forecasting Tools

Forecasting is:

- Laborious
- Time-consuming
- Error-prone

Look for tools that can help...

# Introducing injixo FORECAST

- Part of injixo WFM
- Automatic forecasting engine
- Purpose: Maximum schedule accuracy - with minimum clicks
- Always-on, always up-to-date
- Daily, weekly, annual and other trends identified
- Advanced pattern recognition and self-evaluation algorithms, e.g.
  - Recursive Mean-Squared-Error
  - Difference Map
- Forecasts assigned quality score with red / amber / green indicator
- Anomalies (exceptions) automatically flagged for manual correction
- Let's see it in action...

# Live Demonstration: injixo FORECAST



# injixo - award-winning WFM that costs less than you expect!

- Top-rated WFM in Call Centre Helper 2014 Technology awards, voted no.4 overall
- Cloud: Continuous innovation
- £9 per user per month, including
  - Support & maintenance
  - Hosting, updates, backups
  - No server or heavy IT project
  - Min 99.5% uptime guarantee
- Normally Opex not Capex
- Streamlined implementation
- Flex capacity as needed



## See for yourself

- Join us for a live web demo
- Every Friday at 11:00 UK time
- 90 minutes - deep dive
- Contact [chris.dealy@injixo.com](mailto:chris.dealy@injixo.com) for joining instructions
- And - find us on 