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**BUS 443: Business Analytics**

**Time Series Analysis and Forecasting Case**

***Case Background:***

*Walker & Sons Plumbing Supply is a family-owned business located in Cleveland, Ohio. J.P. Walker started the organization 30 years ago and has grown the client base over three decades to become a successful business. His two sons, John Walker and Landon Walker, both work in the family-owned business. Landon is keenly interested in growing the business and branching out to further the customer reach by establishing a mobile presence.*

*J.P. Walker focuses on improving the day-to-day operations of the business and is most interested in reducing costs. In order to maintain proper inventory levels, J.P. has asked both John and Landon to forecast sales for the following year based on quantitative measures instead of just relying on the subjective opinions of management. He knows this will also allow the company to better plan for future growth that will inevitably occur when the company launches the mobile platform. J.P. wants to develop a system that enables the company to accurately forecast plumbing supplies sales by month for up to one year in advance.*

***Your Task:***

You are interning with the company for the summer as a data analyst. Open the Walker spreadsheet (Time Series Analysis Case Data) on Moodle to view the monthly sales figures (in thousands of American dollars) from the last three years. Perform an analysis of this data for the company. Be sure to plot the time series data and make observations on the pattern you see. From that pattern, pick the appropriate forecasting method.

* If you spot evidence of seasonality in the data, use multiple regression analysis (with the dummy variable approach) to estimate a forecasting model that includes only seasonal effects. Calculate the MSE.
* If you suspect a linear trend in the data, perform linear regression using the time period as your independent variable. Calculate the MSE.
* If you suspect both a trend and seasonality, select a forecasting method to include both of these possibilities. Calculate the MSE.
* Compare the MSE of each method and select the method with the lowest MSE.
* Use the regression equation from the model you selected to forecast monthly sales for the upcoming year.

Once your analysis is complete, write your findings in a managerial report to J.P. Walker. Be sure to explain everything in understandable, business-friendly terms. Include all of your statistical findings and analysis as appendices to the report. Include any recommendations or next steps you have to J.P. and his sons.

Instruction:

Plot the data and look for the pattern

If a trend is involved, create dummy variables to use in the linear regression

Find the lowest MSE

Use the regression equation with the lowest MSE.

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