**Math 1200 -College Algebra for Business names**

**Introduction to Excel V: Exponential Modeling**

0. Housekeeping – Put your name on the first sheet of an Excel workbook. Save the file with the name Excel7Name1.xlsx where Name1, is your name,

1. Creating an exponential model in Excel

We have worked enough with building models for us to look at building models with real world data this time. We are going to start by building an exponential model for the Consumer Price Index (CPI). Download the ExponentialModels file from blackboard. This contains data that you would otherwise have to type.

A) (The naïve model) Select the CPI data, insert a scatterplot and add a trendline, with the formula showing. The trendline should be an exponential model. Add a column to your data with the predicted CPI.

B) (Shifting to get a better formula) The formula given is pretty ugly. The constant coefficient is given in scientific notation with only one digit of accuracy. It represents the value of the CPI in the year 0, assuming a steady rate of inflation through the centuries. This model is pretty useless for prediction. We can make things better by making our independent variable to be years since 1990 rather than years since 0. Insert a column between the column for year and the column for CPI. Fill it in with “years since 1990”. Add a new scatterplot, produce a new equation, and add a new column of predicted values from your new equation. Your new predictions should be close to the actual values.

B2) (More shifting to get a better formula) When Excel give the equation of an exponential model it uses the format

$$f\left(t\right)=P e^{r t}$$

We would like to convert to

$$f\left(t\right)=P R^{ t}$$

For your equation compute $R=e^{r}$

Add another column using the new formula.

All of these methods should give the same prediction each year. Which year has the worst prediction and how far is the prediction from the actual CPI that year?

C) An alternative way to find the base for exponential growth. For each year since 1991, find the ratio of the CPI in each year to t the CPI in the previous year. Take the average of those rates of change to make a different estimate of R. Give that formula that uses that growth rate and the middle year as a base. How far off is the worst year using that method?

D) Interpretation questions: (Answer in a textbox on your worksheet.)

What is the normal rate of inflation for the given time period?

For how the shift in years works. Why does

$$e^{\left(year\right)rate\*time}=e^{\left(year-base\right)rate\*time}e^{\left(base\right)rate\*time}$$

Using Goal seek, find when the CPI is 100.

2. Working with another data set

We want to repeat the process with the different data set. The Excel workbook you downloaded also contains the opening values of the Dow Jones Average for each year dating back to 1990.

A) Find the best fitting exponential model for the Dow Jones averages, convert the equation to a nice form.

B) Explorations:

What is the model’s rate of return for passive investment in the Dow?

Use your model to predict the value of the Dow in 2022.

Use Goal seek to see when the Dow should have been 500. Check to see how accurate this value is.

C) What is the inflation adjusted growth rate of the Dow? (For inflation adjusted growth you need a rate of inflation. That would be the growth rate of the CPI.) Explain how you got this value.

D) Find both the inflation rate and the investment return rate for the periods 1990-2000 and 2009-2018. Speculate on why we get different answers over different periods.

When you finish your worksheet, make sure to share copies with the group and then submit it on blackboard. We will continue working on this on Friday.