A time series model is a forecasting technique that attempts to predict the future values of a variable by using only historical data on that one variable. Here are some examples of variables you can use to forecast. You may use a different source other than the ones listed (be sure to cite your reference). There are many other variables you can use, as long as you have values that are recorded at successive intervals of time. See the CA Starter video in the LiveBinder.

- Currency price: XE (<u>http://www.xe.com/currencyconverter/</u>)
- GNP: Trading Economics (<u>http://www.tradingeconomics.com/united-states/gross-national-product</u>)
- Average home sales: National Association of Realtors (<u>http://www.realtor.org/topics/existing-homesales</u>)
- College tuition: National Center for Education Statistics (<u>https://nces.ed.gov/fastfacts/display.asp?id=76</u>)
- Weather temperature or precipitation: (<u>http://www.weather.gov/help-past-weather</u>)
- Stock price: Yahoo Finance (<u>https://finance.yahoo.com</u>)

Once you have historical data, address the following:

1. Apply quantitative forecasting methods in time-series modeling.

- a State the variable you are forecasting.
- b Collect data for any time horizon (daily, monthly, yearly). Select at least 8 data values.
- c Compute moving average and weighted moving average in a time-series model.
 - i Use the Excel Workbooks for this module to forecast the next period's value using moving average, and weighted moving average (see video in <u>LiveBinder</u>).
 - ii Copy/paste the results of each method into your word document.
 - iii Be sure to state the number of periods used in the moving average method and the weights used in the weighted moving average. Clearly state the "next period" prediction for each method.
 - iv Determine which of the two forecasts should be chosen and give the rationale for the decision.
- d Identify variables for a regression model.
 - i Determine which variable from the time series forecast would be an appropriate dependent variable (X) and tell why.
 - ii Determine which variable from the time series forecast would be an appropriate independent variable (Y) and tell why.
- e **Develop a simple linear regression model.**
 - i Use the regression function found in Data Analysis located in Microsoft Excel to determine the linear regression model.
 - ii Based upon the values given, what is the valid dependent variable range?

*

Year		West
2015	May	325,800
2015	Jun	331,300
2015	Jul	329,300
2015	Aug	322,000
2015	Sep	322,200
2015	Oct	324,200
2015	Nov	321,700
2015	Dec	324,900
2016	Jan	313,400
2016	Feb	312,300
2016	Mar	322,500
2016	Apr	337,800
2016	May	348,100

I will use the National Association of Realtors Website

(<u>http://www.realtor.org/topics/existinghome-sales</u>) and I downloaded the "Single-Family Existing Home Sales and Prices" spreadsheet for Database work.

1. I will look at the (not-seasonally adjusted) **median sale price for the West** column over the past year by month (May 2015 – May 2016). Here is the data:

2&3)

3-Month Moving Average – forecast is \$336,133.33

Number of Periods					Analys	is of Forecas	t Error		
Averaged	3				MAD	MSE	MAPE		
					8490.00000	131943666.66667	2.56453%		
Data	L							Fo	rmulas
Period Number	Data	Indicates which cells in column to the right need a formula	Moving average forecast	error	absolute value of error	squared error	percentag e error	Number of weighted periods	Formula to copy
1	325800								
2	331300								1 325800.00000
3	329300								2 328550.00000
4	322000	ormula Needed	328800.00000	-6800.00000	6800.00000	46240000.00000	2.11%		328800.00000
5	322200	ormula Needed	327533.33333	-5333.33333	5333.33333	28444444.44444	1.66%		4 327100.00000
6	324200	ormula Needed	324500.00000	-300.00000	300.00000	90000.00000	0.09%		5 <mark>326120.00000</mark>
7	321700	ormula Needed	322800.00000	-1100.00000	1100.00000	1210000.00000	0.34%		6 325800.00000
8	324900	ormula Needed	322700.00000	2200.00000	2200.00000	4840000.00000	0.68%		7 <mark>325214.28571</mark>
9	313400	ormula Needed	323600.00000	-10200.00000	10200.00000	104040000.00000	3.25%		325175.00000
10	312300	ormula Needed	320000.00000	-7700.00000	7700.00000	59290000.00000	2.47%		323866.66667
11	322500	ormula Needed	316866.66667	5633.33333	5633.33333	31734444.44444	1.75%	1	322710.00000
12	337800	ormula Needed	316066.66667	21733.33333	21733.33333	472337777.77778	6.43%	1	1 322690.90909
13	348100	ormula Needed	324200.00000	23900.00000	23900.00000	571210000.00000	6.87%	1:	2 323950.00000
14		ormula Needed	336133.33333						
15									

3-Month Weighted Moving Average – forecast is \$340,400

Numb	er of Periods	3		1 		MAD	MSE	MAPE			
				1		8003.33333	107794666.66667	2.42405%			
	Data			1						Fo	ormulas
Period number	data	weight	Indicates which cells in column to the right need a formula	Weighted moving average forecast	error	absolute value of error	squared error	percentage error		Number of weighted periods	Formula to copy
1	325800	1							į		
2	331300	2								1	325800.00000
3	329300	3								2	329466.66667
4	322000		Formula Needed>	329383.33333	-7383.33333	7383.33333	54513611.11111	2.29%		3	329383.33333
5	322200		Formula Needed>	325983.33333	-3783.33333	3783.33333	14313611.11111	1.17%		4	329383.33333
6	324200		Formula Needed>	323316.66667	883.33333	883.33333	780277.77778	0.27%	ĺ	5	329383.33333
7	321700		Formula Needed>	323166.66667	-1466.66667	1466.66667	2151111.11111	0.46%		6	329383.33333
8	324900		Formula Needed>	322616.66667	2283.33333	2283.33333	5213611.11111	0.70%	Ì	7	329383.33333
9	313400		Formula Needed>	323716.66667	-10316.66667	10316.66667	106433611.11111	3.29%		8	329383.33333
10	312300		Formula Needed>	318616.66667	-6316.66667	6316.66667	39900277.77778	2.02%	ľ	9	329383.33333
11	322500		Formula Needed>	314766.66667	7733.33333	7733.33333	59804444.44444	2.40%	Ì	10	329383.33333
12	337800		Formula Needed>	317583.33333	20216.66667	20216.66667	408713611.11111	5.98%		11	329383.33333
13	348100		Formula Needed>	328450.00000	19650.00000	19650.00000	386122500.00000	5.64%	Ĩ	12	329383.33333
14			Formula Needed>	340400.00000							
15									Ì		

Weights are 3 = most recent month, 2 = 1-month prior, 1 = 2-months prior

di. The dependent variable would be west.

dii. The independent variable would be the month and year combination.

ei. The regression equation is west= 469.34 (month) + 322558.42. The month is the number of the month of the data gathered.

SUMMARY	OUTPUT								
Regressi	on Statistics								
Multiple F	0.197493349								
R Square	0.039003623								
Adjusted I	-0.048359684								
Standard I	9705.728507								
Observati	13								
ANOVA									
	df	SS	MS	F	gnificance	F			
Regressio	1	42056406	42056406	0.446453	0.517799				
Residual	11	1.04E+09	94201166						
Total	12	1.08E+09							
	Coefficients	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95.09	pper 95.09	6
Intercept	322558.4206	5558.268	58.03219	4.91E-15	310324.8	334792.1	310324.8	334792.1	
Month and	469.3392425	702.4233	0.668171	0.517799	-1076.68	2015.363	-1076.68	2015.363	

eii. This equation would only be valid during the time period given.