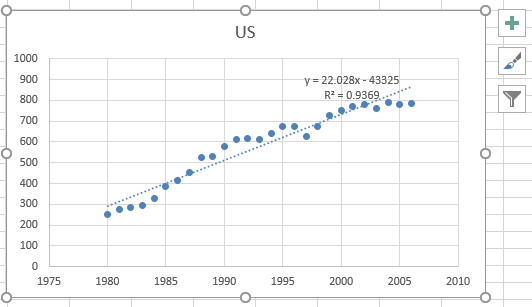
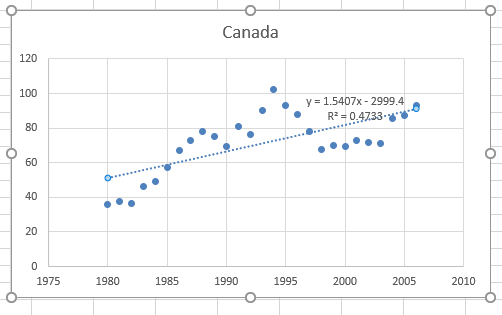
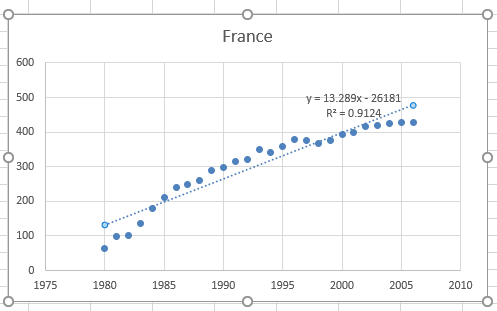
**ANLY500 Homework 7**

You can use R or any other appropriate software for this homework

9.9. Consider the data in the Excel file Nuclear Power. Use simple linear regression to forecast the data. What would be the forecasts for the next 3 years?







Predict in 3 years:

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **US** | **Canada** | **France** |
| 2007 | 887.2 | 92.7849 | 490.02 |
| 2008 | 909.23 | 94.3256 | 503.31 |
| 2009 | 931.26 | 95.8663 | 516.6 |

9.12. Develop a multiple regression model with categorical variables that incorporate seasonality for forecasting housing starts beginning in June 2006 using the data in the Excel file Housing Starts.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SUMMARY OUTPUT | |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| *Regression Statistics* | |  |  |  |  |  |  |  |
| Multiple R | 0.304196 |  |  |  |  |  |  |  |
| R Square | 0.092535 |  |  |  |  |  |  |  |
| Adjusted R Square | -0.16894 |  |  |  |  |  |  |  |
| Standard Error | 46.44408 |  |  |  |  |  |  |  |
| Observations | 54 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |  |  |
|  | *df* | *SS* | *MS* | *F* | *Significance F* |  |  |  |
| Regression | 12 | 9238.196 | 769.8497 | 0.389344 | 0.959773 |  |  |  |
| Residual | 42 | 90596.22 | 2157.053 |  |  |  |  |  |
| Total | 54 | 99834.41 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *Lower 95.0%* | *Upper 95.0%* |
| Intercept | 79.19455 | 22.75678 | 3.480042 | 0.001182 | 33.26951 | 125.1196 | 33.26951 | 125.1196 |
| X Variable 1 | -1.27455 | 2.832331 | -0.45 | 0.655025 | -6.99042 | 4.441329 | -6.99042 | 4.441329 |
| X Variable 2 | 4.774545 | 28.14969 | 0.169613 | 0.866129 | -52.0338 | 61.58292 | -52.0338 | 61.58292 |
| X Variable 3 | 18.48909 | 27.16676 | 0.680578 | 0.499874 | -36.3357 | 73.31384 | -36.3357 | 73.31384 |
| X Variable 4 | 23.92364 | 26.45194 | 0.904419 | 0.370932 | -29.4585 | 77.30581 | -29.4585 | 77.30581 |
| X Variable 5 | 32.53818 | 26.02732 | 1.250155 | 0.218164 | -19.9871 | 85.06345 | -19.9871 | 85.06345 |
| X Variable 6 | 33.13273 | 25.90718 | 1.278901 | 0.207953 | -19.1501 | 85.41554 | -19.1501 | 85.41554 |
| X Variable 7 | 37.80227 | 28.08629 | 1.345933 | 0.185545 | -18.8782 | 94.4827 | -18.8782 | 94.4827 |
| X Variable 8 | 30.32682 | 28.54275 | 1.062505 | 0.294078 | -27.2748 | 87.92842 | -27.2748 | 87.92842 |
| X Variable 9 | 26.80136 | 29.26742 | 0.915741 | 0.365031 | -32.2627 | 85.8654 | -32.2627 | 85.8654 |
| X Variable 10 | 23.12591 | 30.24102 | 0.76472 | 0.448714 | -37.9029 | 84.15475 | -37.9029 | 84.15475 |
| X Variable 11 | 8.275455 | 31.44043 | 0.263211 | 0.793675 | -55.1739 | 71.72481 | -55.1739 | 71.72481 |
| X Variable 12 | 0 | 0 | 65535 | #NUM! | 0 | 0 | 0 | 0 |

9.17. Choose an appropriate forecasting technique for the data in the Excel file Coal Consumption and find the best forecasting model. Explain how you would use the model to forecast and how far into the future, it would be appropriate to forecast.

|  |
| --- |
| Because its trend is similar to seasonality data, so we choose regression-based seasonal forecast model |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SUMMARY OUTPUT | |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| *Regression Statistics* | |  |  |  |  |  |  |  |
| Multiple R | 0.946989 |  |  |  |  |  |  |  |
| R Square | 0.896788 |  |  |  |  |  |  |  |
| Adjusted R Square | 0.88638 |  |  |  |  |  |  |  |
| Standard Error | 1.3833 |  |  |  |  |  |  |  |
| Observations | 132 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |  |  |
|  | *df* | *SS* | *MS* | *F* | *Significance F* |  |  |  |
| Regression | 12 | 1978.508 | 164.8757 | 86.16365 | 9.64E-53 |  |  |  |
| Residual | 119 | 227.7086 | 1.913518 |  |  |  |  |  |
| Total | 131 | 2206.217 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *Lower 95.0%* | *Upper 95.0%* |
| Intercept | 17.92405 | 0.459799 | 38.98236 | 1.3E-69 | 17.0136 | 18.8345 | 17.0136 | 18.8345 |
| X Variable 1 | -0.01759 | 0.003173 | -5.54352 | 1.81E-07 | -0.02387 | -0.01131 | -0.02387 | -0.01131 |
| X Variable 2 | -3.2315 | 0.589849 | -5.47851 | 2.43E-07 | -4.39946 | -2.06354 | -4.39946 | -2.06354 |
| X Variable 3 | -5.61032 | 0.589875 | -9.51104 | 2.69E-16 | -6.77834 | -4.44231 | -6.77834 | -4.44231 |
| X Variable 4 | -5.45345 | 0.589918 | -9.24443 | 1.15E-15 | -6.62155 | -4.28535 | -6.62155 | -4.28535 |
| X Variable 5 | -9.2013 | 0.589977 | -15.596 | 1.52E-30 | -10.3695 | -8.03309 | -10.3695 | -8.03309 |
| X Variable 6 | -8.86665 | 0.590054 | -15.0268 | 2.9E-29 | -10.035 | -7.69829 | -10.035 | -7.69829 |
| X Variable 7 | -6.49936 | 0.590148 | -11.0131 | 7.07E-20 | -7.66791 | -5.3308 | -7.66791 | -5.3308 |
| X Variable 8 | -7.41224 | 0.590259 | -12.5576 | 1.51E-23 | -8.58101 | -6.24346 | -8.58101 | -6.24346 |
| X Variable 9 | -9.32053 | 0.590387 | -15.7872 | 5.71E-31 | -10.4896 | -8.15151 | -10.4896 | -8.15151 |
| X Variable 10 | -8.30371 | 0.590532 | -14.0614 | 4.66E-27 | -9.47302 | -7.1344 | -9.47302 | -7.1344 |
| X Variable 11 | -2.63035 | 0.590694 | -4.45298 | 1.92E-05 | -3.79998 | -1.46072 | -3.79998 | -1.46072 |
| X Variable 12 | 3.42195 | 0.590873 | 5.791351 | 5.81E-08 | 2.251963 | 4.591937 | 2.251963 | 4.591937 |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| RESIDUAL OUTPUT | |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| *Observation* | *Predicted Y* | *Residuals* | *Standard Residuals* |  |  |  |  |  |
| 1 | 17.90646 | -1.411 | -1.07022 |  |  |  |  |  |
| 2 | 14.65737 | 0.512939 | 0.389055 |  |  |  |  |  |
| 3 | 12.26096 | 0.487588 | 0.369827 |  |  |  |  |  |
| 4 | 12.40024 | -0.09392 | -0.07123 |  |  |  |  |  |
| 5 | 8.634803 | -0.29933 | -0.22704 |  |  |  |  |  |
| 6 | 8.951863 | -0.32102 | -0.24349 |  |  |  |  |  |
| 7 | 11.30157 | 1.071924 | 0.813036 |  |  |  |  |  |
| 8 | 10.3711 | 1.162197 | 0.881507 |  |  |  |  |  |
| 9 | 8.445215 | 1.025844 | 0.778086 |  |  |  |  |  |
| 10 | 9.44445 | 0.121633 | 0.092256 |  |  |  |  |  |
| 11 | 15.10022 | -0.65912 | -0.49993 |  |  |  |  |  |
| 12 | 21.13493 | 3.362823 | 2.550645 |  |  |  |  |  |
| 13 | 17.69539 | 2.239809 | 1.698858 |  |  |  |  |  |
| 14 | 14.44631 | -0.45706 | -0.34667 |  |  |  |  |  |
| 15 | 12.04989 | 0.447467 | 0.339396 |  |  |  |  |  |
| 16 | 12.18918 | -2.87355 | -2.17954 |  |  |  |  |  |
| 17 | 8.423739 | -0.79167 | -0.60047 |  |  |  |  |  |
| 18 | 8.740799 | -1.30515 | -0.98994 |  |  |  |  |  |
| 19 | 11.09051 | -1.22864 | -0.93191 |  |  |  |  |  |
| 20 | 10.16004 | -1.23874 | -0.93956 |  |  |  |  |  |
| 21 | 8.23415 | -0.85199 | -0.64622 |  |  |  |  |  |
| 22 | 9.233386 | -1.06451 | -0.80741 |  |  |  |  |  |
| 23 | 14.88916 | 0.76569 | 0.580763 |  |  |  |  |  |
| 24 | 20.92387 | -0.85624 | -0.64945 |  |  |  |  |  |
| 25 | 17.48433 | -0.5045 | -0.38266 |  |  |  |  |  |
| 26 | 14.23524 | -0.7837 | -0.59442 |  |  |  |  |  |
| 27 | 11.83883 | 0.309663 | 0.234874 |  |  |  |  |  |
| 28 | 11.97811 | 0.316699 | 0.240211 |  |  |  |  |  |
| 29 | 8.212675 | -0.79677 | -0.60434 |  |  |  |  |  |
| 30 | 8.529735 | -1.69928 | -1.28887 |  |  |  |  |  |
| 31 | 10.87944 | 0.082396 | 0.062496 |  |  |  |  |  |
| 32 | 9.948974 | -0.86219 | -0.65396 |  |  |  |  |  |
| 33 | 8.023086 | 0.486778 | 0.369213 |  |  |  |  |  |
| 34 | 9.022322 | -0.53462 | -0.4055 |  |  |  |  |  |
| 35 | 14.67809 | 0.156053 | 0.118364 |  |  |  |  |  |
| 36 | 20.71281 | 0.441976 | 0.335231 |  |  |  |  |  |
| 37 | 17.27327 | -2.06229 | -1.56422 |  |  |  |  |  |
| 38 | 14.02418 | 0.7264 | 0.550962 |  |  |  |  |  |
| 39 | 11.62776 | 0.183306 | 0.139034 |  |  |  |  |  |
| 40 | 11.76705 | 2.338797 | 1.773938 |  |  |  |  |  |
| 41 | 8.001611 | -0.57749 | -0.43802 |  |  |  |  |  |
| 42 | 8.31867 | 1.295579 | 0.982675 |  |  |  |  |  |
| 43 | 10.66838 | -0.90998 | -0.6902 |  |  |  |  |  |
| 44 | 9.73791 | -0.96067 | -0.72866 |  |  |  |  |  |
| 45 | 7.812022 | -1.18268 | -0.89704 |  |  |  |  |  |
| 46 | 8.811257 | 0.072237 | 0.05479 |  |  |  |  |  |
| 47 | 14.46703 | 0.453019 | 0.343607 |  |  |  |  |  |
| 48 | 20.50174 | 0.665744 | 0.504956 |  |  |  |  |  |
| 49 | 17.0622 | 2.673776 | 2.028014 |  |  |  |  |  |
| 50 | 13.81312 | 1.651921 | 1.252954 |  |  |  |  |  |
| 51 | 11.4167 | -0.02757 | -0.02091 |  |  |  |  |  |
| 52 | 11.55599 | -1.04299 | -0.79109 |  |  |  |  |  |
| 53 | 7.790546 | -0.06226 | -0.04722 |  |  |  |  |  |
| 54 | 8.107606 | 1.09127 | 0.82771 |  |  |  |  |  |
| 55 | 10.45731 | 0.076622 | 0.058117 |  |  |  |  |  |
| 56 | 9.526846 | -0.47138 | -0.35753 |  |  |  |  |  |
| 57 | 7.600958 | -0.94796 | -0.71901 |  |  |  |  |  |
| 58 | 8.600193 | -0.80098 | -0.60753 |  |  |  |  |  |
| 59 | 14.25597 | -1.76182 | -1.33631 |  |  |  |  |  |
| 60 | 20.29068 | -1.89581 | -1.43794 |  |  |  |  |  |
| 61 | 16.85114 | -2.10919 | -1.59979 |  |  |  |  |  |
| 62 | 13.60205 | -0.37164 | -0.28189 |  |  |  |  |  |
| 63 | 11.20564 | -1.30059 | -0.98647 |  |  |  |  |  |
| 64 | 11.34492 | -0.96759 | -0.7339 |  |  |  |  |  |
| 65 | 7.579482 | -0.85392 | -0.64769 |  |  |  |  |  |
| 66 | 7.896542 | -1.1447 | -0.86823 |  |  |  |  |  |
| 67 | 10.24625 | -1.08277 | -0.82126 |  |  |  |  |  |
| 68 | 9.315782 | -0.10278 | -0.07796 |  |  |  |  |  |
| 69 | 7.389894 | -1.19834 | -0.90892 |  |  |  |  |  |
| 70 | 8.389129 | -0.53478 | -0.40562 |  |  |  |  |  |
| 71 | 14.0449 | 2.597542 | 1.970192 |  |  |  |  |  |
| 72 | 20.07961 | 3.758059 | 2.850425 |  |  |  |  |  |
| 73 | 16.64007 | -0.59145 | -0.44861 |  |  |  |  |  |
| 74 | 13.39099 | -0.08572 | -0.06502 |  |  |  |  |  |
| 75 | 10.99457 | 1.110479 | 0.84228 |  |  |  |  |  |
| 76 | 11.13386 | 0.287398 | 0.217987 |  |  |  |  |  |
| 77 | 7.368418 | 1.397403 | 1.059907 |  |  |  |  |  |
| 78 | 7.685478 | -0.23311 | -0.17681 |  |  |  |  |  |
| 79 | 10.03519 | 0.151248 | 0.114719 |  |  |  |  |  |
| 80 | 9.104717 | 0.650373 | 0.493297 |  |  |  |  |  |
| 81 | 7.178829 | 0.519046 | 0.393687 |  |  |  |  |  |
| 82 | 8.178065 | -0.31557 | -0.23935 |  |  |  |  |  |
| 83 | 13.83384 | 1.432891 | 1.086824 |  |  |  |  |  |
| 84 | 19.86855 | -1.53881 | -1.16716 |  |  |  |  |  |
| 85 | 16.42901 | 2.185488 | 1.657655 |  |  |  |  |  |
| 86 | 13.17992 | 0.354254 | 0.268696 |  |  |  |  |  |
| 87 | 10.78351 | 0.682385 | 0.517577 |  |  |  |  |  |
| 88 | 10.92279 | 2.013745 | 1.527392 |  |  |  |  |  |
| 89 | 7.157354 | 1.3746 | 1.042611 |  |  |  |  |  |
| 90 | 7.474414 | 0.133494 | 0.101253 |  |  |  |  |  |
| 91 | 9.824122 | 1.452506 | 1.101701 |  |  |  |  |  |
| 92 | 8.893653 | 0.786904 | 0.596853 |  |  |  |  |  |
| 93 | 6.967765 | 1.151404 | 0.87332 |  |  |  |  |  |
| 94 | 7.967001 | 0.706348 | 0.535753 |  |  |  |  |  |
| 95 | 13.62277 | 1.171485 | 0.888552 |  |  |  |  |  |
| 96 | 19.65748 | 0.489474 | 0.371258 |  |  |  |  |  |
| 97 | 16.21795 | 0.342057 | 0.259444 |  |  |  |  |  |
| 98 | 12.96886 | 0.558434 | 0.423563 |  |  |  |  |  |
| 99 | 10.57244 | 2.954851 | 2.241205 |  |  |  |  |  |
| 100 | 10.71173 | 0.873157 | 0.662275 |  |  |  |  |  |
| 101 | 6.94629 | 1.081532 | 0.820324 |  |  |  |  |  |
| 102 | 7.263349 | 2.200345 | 1.668924 |  |  |  |  |  |
| 103 | 9.613058 | 1.138699 | 0.863684 |  |  |  |  |  |
| 104 | 8.682589 | 1.601702 | 1.214864 |  |  |  |  |  |
| 105 | 6.756701 | 1.28374 | 0.973695 |  |  |  |  |  |
| 106 | 7.755936 | 4.510012 | 3.420768 |  |  |  |  |  |
| 107 | 13.41171 | 0.606535 | 0.460046 |  |  |  |  |  |
| 108 | 19.44642 | -1.92363 | -1.45904 |  |  |  |  |  |
| 109 | 16.00688 | -0.00902 | -0.00684 |  |  |  |  |  |
| 110 | 12.7578 | -0.76865 | -0.58301 |  |  |  |  |  |
| 111 | 10.36138 | -3.39697 | -2.57654 |  |  |  |  |  |
| 112 | 10.50066 | -0.48417 | -0.36724 |  |  |  |  |  |
| 113 | 6.735225 | -0.5978 | -0.45342 |  |  |  |  |  |
| 114 | 7.052285 | 0.094736 | 0.071856 |  |  |  |  |  |
| 115 | 9.401993 | 0.317668 | 0.240945 |  |  |  |  |  |
| 116 | 8.471525 | -0.61699 | -0.46797 |  |  |  |  |  |
| 117 | 6.545637 | -0.8189 | -0.62112 |  |  |  |  |  |
| 118 | 7.544872 | -0.27296 | -0.20703 |  |  |  |  |  |
| 119 | 13.20065 | -3.06612 | -2.3256 |  |  |  |  |  |
| 120 | 19.23536 | -1.69039 | -1.28213 |  |  |  |  |  |
| 121 | 15.79582 | -0.75366 | -0.57164 |  |  |  |  |  |
| 122 | 12.54673 | -1.33717 | -1.01422 |  |  |  |  |  |
| 123 | 10.15031 | -1.45062 | -1.10027 |  |  |  |  |  |
| 124 | 10.2896 | -0.36758 | -0.2788 |  |  |  |  |  |
| 125 | 6.524161 | 0.125703 | 0.095343 |  |  |  |  |  |
| 126 | 6.841221 | -0.11217 | -0.08508 |  |  |  |  |  |
| 127 | 9.190929 | -1.06968 | -0.81133 |  |  |  |  |  |
| 128 | 8.260461 | 0.05157 | 0.039115 |  |  |  |  |  |
| 129 | 6.334572 | 0.533053 | 0.404311 |  |  |  |  |  |
| 130 | 7.333808 | -1.88683 | -1.43113 |  |  |  |  |  |
| 131 | 12.98958 | -1.69616 | -1.28651 |  |  |  |  |  |
| 132 | 19.02429 | -0.81319 | -0.61679 |  |  |  |  |  |

9.22. Choose an appropriate forecasting technique for the data in the Excel file *Treasury Yield Rates* and find the best forecasting model. Explain how you would use the model to forecast and how far into the future, it would be appropriate to forecast.

|  |
| --- |
| Because data has not neither clear trend or seasonality, so we should chose the single moving average model |

