

| year | y1     | x1 | x2 1st diff. | x3    | x4 1st diff. | x5     | x6     | x7       |
|------|--------|----|--------------|-------|--------------|--------|--------|----------|
| 2008 | 71.172 | 1  | -6.7         | 17.14 | 1044.01      | 7.2996 | 770.45 | 1.16864  |
| 2009 | 43.196 | 1  | 0.49         | 7.32  | 507.35       | 6.8367 | 649.29 | 1.60892  |
| 2010 | 57.244 | 1  | 27.67        | 7.4   | 985.5        | 6.8281 | 776.97 | 1.45542  |
| 2011 | 88.108 | 1  | -1.73        | 8.42  | 1464.36      | 6.6215 | 838.79 | 1.56578  |
| 2012 | 86.45  | 1  | 2.4          | 5.1   | 980.64       | 6.3001 | 880.56 | 1.881275 |
| 2013 | 84.7   | 1  | 3.07         | 5.85  | 1038.28      | 6.2897 | 957.8  | 1.7762   |
| 2014 | 79.46  | 1  | 26.61        | 6.71  | 905.15       | 6.099  | 938.93 | 2.17448  |
| 2015 | 45.96  | 1  | 43.38        | 6.67  | 585.95       | 6.1248 | 864.31 | 2.314539 |
| 2016 | 36.69  | 1  | 119.71       | 14.55 | 171.74       | 6.5126 | 869.68 | 2.99268  |
| 2017 | 48.3   | 1  | -15.73       | 7.44  | 1077.18      | 6.9552 | 858.99 | 3.59825  |
| 2018 | 60.96  | 1  | 18.92        | 6.02  | 1584.42      | 6.4959 | 778.48 | 3.75345  |
| 2019 | 57.31  | 1  | 37.95        | 5.25  | 385.06       | 6.8557 | 759.93 | 5.39474  |
| 2020 | 46.45  | 1  | 31.04        | 6.77  | 407.77       | 6.97   | 720.29 | 5.924539 |
| 2021 | 60.62  | 1  | 12.62        | 8.04  | 3132.72      | 6.4682 | 819.03 | 7.365    |
| 2022 | 84.66  | 1  | 35.01        | 8     | 142.71       | 6.37   | 905.99 | 13.6105  |

| x8 1st diff. | x9      | x10    |
|--------------|---------|--------|
| 361.15       | 24.5462 | 50.282 |
| -438.2       | 29.3916 | 30.003 |
| 302.27       | 30.1851 | 41.56  |
| 521          | 30.3505 | 63.811 |
| 162.37       | 32.1961 | 64.961 |
| 84.18        | 30.3727 | 63.372 |
| -233.23      | 32.6587 | 59.31  |
| -695.76      | 56.2376 | 30.36  |
| -86.69       | 72.9299 | 22.734 |
| 297.41       | 60.6569 | 31.415 |
| 83.13        | 57.6002 | 43.451 |
| 35.78        | 69.4706 | 40.049 |
| -200.03      | 61.9057 | 30.473 |
| 343.81       | 73.8757 | 39.573 |
| 403.53       | 74.2926 | 58.33  |

|      | KZ Export bill.<br>USD | Constant | KZT<br>exchange<br>rate | KZ<br>inflation % | GDP of main<br>trading<br>partner China<br>bill. USD | Chinese<br>Yuan<br>exchange<br>rate | GDP of<br>Turkey bill.<br>USD |
|------|------------------------|----------|-------------------------|-------------------|--|-------------------------------------|-------------------------------|
| year | y1                     | x1       | x2 1st diff.            | x3                | x4 1st diff.   | x5                                  | x6                            |
| 2008 | 71.172                 | 1        | -6.7                    | 17.14             | 1044.01  | 7.2996                              | 770.45                        |
| 2009 | 43.196                 | 1        | 0.49                    | 7.32              | 507.35   | 6.8367                              | 649.29                        |
| 2010 | 57.244                 | 1        | 27.67                   | 7.4               | 985.5  | 6.8281                              | 776.97                        |
| 2011 | 88.108                 | 1        | -1.73                   | 8.42              | 1464.36  | 6.6215                              | 838.79                        |
| 2012 | 86.45                  | 1        | 2.4                     | 5.1               | 980.64   | 6.3001                              | 880.56                        |
| 2013 | 84.7                   | 1        | 3.07                    | 5.85              | 1038.28  | 6.2897                              | 957.8                         |
| 2014 | 79.46                  | 1        | 26.61                   | 6.71              | 905.15   | 6.099                               | 938.93                        |
| 2015 | 45.96                  | 1        | 43.38                   | 6.67              | 585.95   | 6.1248                              | 864.31                        |
| 2016 | 36.69                  | 1        | 119.71                  | 14.55             | 171.74   | 6.5126                              | 869.68                        |
| 2017 | 48.3                   | 1        | -15.73                  | 7.44              | 1077.18  | 6.9552                              | 858.99                        |
| 2018 | 60.96                  | 1        | 18.92                   | 6.02              | 1584.42  | 6.4959                              | 778.48                        |
| 2019 | 57.31                  | 1        | 37.95                   | 5.25              | 385.06   | 6.8557                              | 759.93                        |
| 2020 | 46.45                  | 1        | 31.04                   | 6.77              | 407.77   | 6.97                                | 720.29                        |
| 2021 | 60.62                  | 1        | 12.62                   | 8.04              | 3132.72  | 6.4682                              | 819.03                        |
| 2022 | 84.66                  | 1        | 35.01                   | 8                 | 142.71   | 6.37                                | 905.99                        |

stat significance

|                            | x1        | x2         | x3         | x4         | x5        | x6         |
|----------------------------|-----------|------------|------------|------------|-----------|------------|
| Matrix (XTX) <sup>-1</sup> | 220.0216  | 0.000357   | 0.020775   | 2.9829E-07 | 3.363209  | 4.5422E-05 |
| sii                        | 440.0432  | 0.000714   | 0.04155    | 5.9658E-07 | 6.726418  | 9.0844E-05 |
| sbi                        | 20.97721  | 0.026729   | 0.203838   | 0.00077238 | 2.593534  | 0.00953119 |
| abs par val                | 17.46791  | 0.035434   | 0.376927   | 4.4715E-05 | 2.094384  | 0.00110398 |
| t value                    | 0.832709  | 1.325675   | 1.849149   | 0.05789194 | 0.807541  | 0.11582784 |
| crit t value               | 2.145     | 2.145      | 2.145      | 2.145      | 2.145     | 2.145      |
| comparison                 | 0.48<.145 | 1.17<2.145 | 1.86<2.145 | 0.04<2.145 | 0.5<2.145 | 0.09<2.145 |
| SS or SI                   | SI        | SI         | SI         | SI         | SI        | SI         |

|          |              |
|----------|--------------|
| 17.46791 | x1           |
| -0.03543 | x2 1st diff. |
| 0.37693  | x3           |
| -0.00004 | x4 1st diff. |
| -2.09438 | x5           |
| -0.00110 | x6           |
| 0.28273  | x7           |
| 0.00097  | x8 1st diff. |
| 0.05914  | x9           |
| 1.21981  | x10          |

17.46791 -0.03543435 0.376927 -4.4715E-05



| Turkish Lira exchange rate | GDP of Russia bill. USD | Russian Ruble exchange rate | KZ raw material export bill. USD |
|----------------------------|-------------------------|-----------------------------|----------------------------------|
| x7                         | x8 1st diff.            | x9                          | x10                              |
| 1.16864                    | 1                       | 24.5462                     | 50.282                           |
| 1.60892                    | 0                       | 29.3916                     | 30.003                           |
| 1.45542                    | 0                       | 30.1851                     | 41.56                            |
| 1.56578                    | 0                       | 30.3505                     | 63.811                           |
| 1.881275                   | 0                       | 32.1961                     | 64.961                           |
| 1.7762                     | 0                       | 30.3727                     | 63.372                           |
| 2.17448                    | 0                       | 32.6587                     | 59.31                            |
| 2.314539                   | 0                       | 56.2376                     | 30.36                            |
| 2.99268                    | 0                       | 72.9299                     | 22.734                           |
| 3.59825                    | 0                       | 60.6569                     | 31.415                           |
| 3.75345                    | 0                       | 57.6002                     | 43.451                           |
| 5.39474                    | 0                       | 69.4706                     | 40.049                           |
| 5.924539                   | 1                       | 61.9057                     | 30.473                           |
| 7.365                      | 0                       | 73.8757                     | 39.573                           |
| 13.6105                    | 0                       | 74.2926                     | 58.33                            |

| x7        | x8         | x9         | x10         |
|-----------|------------|------------|-------------|
| 0.03927   | 1.10561513 | 0.002247   | 0.00185328  |
| 0.078541  | 2.21123027 | 0.004494   | 0.00370657  |
| 0.280251  | 1.4870206  | 0.067036   | 0.06088159  |
| 0.282725  | 0.00096772 | 0.059136   | 1.21980628  |
| 1.008828  | 0.00065078 | 0.882153   | 20.0357169  |
| 2.145     | 2.145      | 2.145      | 2.145       |
| 0.9<2.145 | 0.33<2.145 | 0.88<2.145 | 16.17>2.145 |
| SI        | SI         | SI         | SS          |

OLSM  $(XT^*X)^{-1}XT^*Y$

XT

|         |         |
|---------|---------|
| 1       | 1       |
| -6.7    | 0.49    |
| 17.14   | 7.32    |
| 1044.01 | 507.35  |
| 7.2996  | 6.8367  |
| 770.45  | 649.29  |
| 1.16864 | 1.60892 |
| 1       | 0       |
| 24.5462 | 29.3916 |
| 50.282  | 30.003  |

XT\*X

|          |          |
|----------|----------|
| 15       | 334.71   |
| 334.71   | 22143.39 |
| 120.68   | 3106.608 |
| 14412.84 | 178428.4 |
| 99.0271  | 2168.624 |
| 12389.49 | 281314.6 |
| 56.58441 | 1529.503 |
| 2        | 24.34    |
| 736.6701 | 21069.17 |
| 669.684  | 12019.81 |

$(XT^*X)^{-1}$

|          |          |
|----------|----------|
| 220.0216 | -0.16474 |
| -0.16474 | 0.000357 |
| 1.322838 | -0.00186 |
| -0.00362 | 7.19E-06 |
| -26.5308 | 0.022584 |
| -0.07477 | 4.88E-05 |
| -0.74719 | 0.001649 |
| 2.308462 | 0.001469 |
| 0.241597 | -0.00053 |
| 0.092137 | -0.00011 |

$(XT^*X)^{-1}XT$

|          |          |
|----------|----------|
| 0.745055 | 6.518045 |
| -0.00417 | -0.0047  |
| 0.065685 | 0.035661 |
| -5.7E-05 | -0.00013 |
| -0.14381 | -0.53132 |
| -0.00066 | -0.0027  |

-0.02085 0.033957  
 0.220833 -0.34902  
 0.004571 -0.00851  
 0.00579 -0.00974

$(X^T X)^{-1} X^T Y$

-2.09438 -0.00110398 0.282725 0.00096772 0.059136 1.219806

|          |              |
|----------|--------------|
| 7.894159 | x1           |
| -0.03079 | x2 1st diff. |
| 0.359373 | x3           |
|          |              |
| 0.000205 | x4 1st diff. |
|          |              |
| -1.02234 | x5           |
|          |              |
| 0.00088  | x6           |
|          |              |
| 0.311985 | x7           |
|          |              |
| 0.022966 | x8 1st diff. |
|          |              |
| 0.058029 | x9           |
|          |              |
| 1.234521 | x10          |

|         |         |          |         |         |          |         |         |
|---------|---------|----------|---------|---------|----------|---------|---------|
| 1       | 1       | 1        | 1       | 1       | 1        | 1       | 1       |
| 27.67   | -1.73   | 2.4      | 3.07    | 26.61   | 43.38    | 119.71  | -15.73  |
| 7.4     | 8.42    | 5.1      | 5.85    | 6.71    | 6.67     | 14.55   | 7.44    |
| 985.5   | 1464.36 | 980.64   | 1038.28 | 905.15  | 585.95   | 171.74  | 1077.18 |
| 6.8281  | 6.6215  | 6.3001   | 6.2897  | 6.099   | 6.1248   | 6.5126  | 6.9552  |
| 776.97  | 838.79  | 880.56   | 957.8   | 938.93  | 864.31   | 869.68  | 858.99  |
| 1.45542 | 1.56578 | 1.881275 | 1.7762  | 2.17448 | 2.314539 | 2.99268 | 3.59825 |
| 0       | 0       | 0        | 0       | 0       | 0        | 0       | 0       |
| 30.1851 | 30.3505 | 32.1961  | 30.3727 | 32.6587 | 56.2376  | 72.9299 | 60.6569 |
| 41.56   | 63.811  | 64.961   | 63.372  | 59.31   | 30.36    | 22.734  | 31.415  |

|             |          |          |          |          |          |          |          |
|-------------|----------|----------|----------|----------|----------|----------|----------|
| 120.68      | 14412.84 | 99.0271  | 12389.49 | 56.58441 | 2        | 736.6701 | 669.684  |
| 3106.6082   | 178428.4 | 2168.624 | 281314.6 | 1529.503 | 24.34    | 21069.17 | 12019.81 |
| 1128.0974   | 113450   | 803.8967 | 99359.76 | 435.2161 | 23.91    | 5882.209 | 5256.235 |
| 113449.9509 | 21514282 | 94889.59 | 11931563 | 52621.97 | 1451.78  | 703505.5 | 669822.9 |
| 803.896708  | 94889.59 | 655.4359 | 81508.74 | 371.8127 | 14.2696  | 4854.543 | 4397.29  |
| 99359.7558  | 11931563 | 81508.74 | 10331987 | 47134.86 | 1490.74  | 609186   | 562087.4 |
| 435.2161251 | 52621.97 | 371.8127 | 47134.86 | 364.988  | 7.093179 | 3432.633 | 2527.558 |
| 23.91       | 1451.78  | 14.2696  | 1490.74  | 7.093179 | 2        | 86.4519  | 80.755   |
| 5882.208656 | 703505.5 | 4854.543 | 609186   | 3432.633 | 86.4519  | 41438.33 | 30959.85 |
| 5256.23536  | 669822.9 | 4397.29  | 562087.4 | 2527.558 | 80.755   | 30959.85 | 32795.55 |

|              |          |          |          |          |          |          |          |
|--------------|----------|----------|----------|----------|----------|----------|----------|
| 1.322837945  | -0.00362 | -26.5308 | -0.07477 | -0.74719 | 2.308462 | 0.241597 | 0.092137 |
| -0.001863833 | 7.19E-06 | 0.022584 | 4.88E-05 | 0.001649 | 0.001469 | -0.00053 | -0.00011 |
| 0.020774967  | -4.1E-05 | -0.17495 | -0.00054 | -0.00908 | -0.0416  | 0.003226 | 0.001703 |
| -4.07183E-05 | 2.98E-07 | 0.000473 | 1.56E-06 | 5.31E-05 | 7.2E-05  | -1.5E-05 | -8.2E-06 |
| -0.174947196 | 0.000473 | 3.363209 | 0.008121 | 0.114143 | -0.40559 | -0.03599 | -0.01209 |
| -0.000543517 | 1.56E-06 | 0.008121 | 4.54E-05 | 0.000618 | 0.000714 | -0.00018 | -0.00018 |
| -0.009084436 | 5.31E-05 | 0.114143 | 0.000618 | 0.03927  | -0.01419 | -0.00845 | -0.00589 |
| -0.041601598 | 7.2E-05  | -0.40559 | 0.000714 | -0.01419 | 1.105615 | 0.00086  | -0.00277 |
| 0.003225734  | -1.5E-05 | -0.03599 | -0.00018 | -0.00845 | 0.00086  | 0.002247 | 0.001512 |
| 0.001702853  | -8.2E-06 | -0.01209 | -0.00018 | -0.00589 | -0.00277 | 0.001512 | 0.001853 |

|              |          |          |          |          |          |          |          |
|--------------|----------|----------|----------|----------|----------|----------|----------|
| -7.532157574 | -0.20613 | 2.192195 | -3.1427  | 0.949543 | 7.108833 | -1.40968 | -5.34012 |
| 0.012433175  | -0.00046 | -0.00208 | 0.001686 | 0.002176 | -0.00639 | 0.005252 | -0.00727 |
| -0.077063095 | 0.019391 | 0.000987 | -0.03482 | -0.01495 | 0.027491 | 0.029732 | -0.00434 |
| 0.000285458  | -6.1E-06 | -9.3E-05 | 4.9E-05  | 4.36E-05 | -0.00015 | -9.1E-06 | -8.2E-05 |
| 1.116782369  | 0.045597 | -0.29515 | 0.281161 | -0.18292 | -0.94986 | 0.116234 | 0.537149 |
| 0.002719466  | -0.0014  | -0.00121 | 0.002484 | 0.001124 | -0.00063 | 0.00035  | 0.003135 |

|              |          |          |          |          |          |          |          |
|--------------|----------|----------|----------|----------|----------|----------|----------|
| 0.100596637  | -0.04523 | -0.05479 | 0.009796 | 0.020544 | -0.03483 | -0.02449 | -0.01488 |
| -0.212514169 | -0.19873 | 0.064688 | 0.102276 | 0.162918 | 0.200915 | -0.17226 | -0.24049 |
| -0.032323962 | 0.008678 | 0.0104   | -0.00763 | -0.00949 | 0.006899 | 0.003204 | 0.005184 |
| -0.016026995 | 0.017006 | 0.014256 | -0.00401 | -0.00464 | -0.00944 | 0.000682 | -0.01387 |

|   |
|---|
| Constant                                    |
| KZT exchange rate                           |
| KZ inflation %                              |
| GDP of main trading partner China bill. USD |
| Chinese Yuan exchange rate                  |
| GDP of Turkey bill. USD                     |
| Turkish Lira exchange rate                  |
| GDP of Russia bill. USD                     |
| Russian Ruble exchange rate                 |
| KZ raw material export bill. USD            |

|         |         |          |         |         |
|---------|---------|----------|---------|---------|
| 1       | 1       | 1        | 1       | 1       |
| 18.92   | 37.95   | 31.04    | 12.62   | 35.01   |
| 6.02    | 5.25    | 6.77     | 8.04    | 8       |
| 1584.42 | 385.06  | 407.77   | 3132.72 | 142.71  |
| 6.4959  | 6.8557  | 6.97     | 6.4682  | 6.37    |
| 778.48  | 759.93  | 720.29   | 819.03  | 905.99  |
| 3.75345 | 5.39474 | 5.924539 | 7.365   | 13.6105 |
| 0       | 0       | 1        | 0       | 0       |
| 57.6002 | 69.4706 | 61.9057  | 73.8757 | 74.2926 |
| 43.451  | 40.049  | 30.473   | 39.573  | 58.33   |

|          |          |          |          |          |
|----------|----------|----------|----------|----------|
| 3.697346 | -2.94616 | -0.74506 | 0.382706 | 0.72828  |
| -0.0023  | 0.001259 | 0.004172 | 0.001853 | -0.00148 |
| 0.014263 | -0.02364 | -0.06569 | 0.000821 | 0.026471 |
| -1.1E-05 | -0.00013 | 5.67E-05 | 0.000348 | -0.00012 |
| -0.40833 | 0.449588 | 0.143805 | -0.06215 | -0.11678 |
| -0.00254 | -0.00149 | 0.000658 | 8.32E-05 | 6.93E-05 |

|          |          |          |          |          |
|----------|----------|----------|----------|----------|
| -0.05911 | -0.07066 | 0.020849 | 0.043393 | 0.0957   |
| -0.00328 | -0.19254 | 0.779167 | 0.0286   | -0.19057 |
| 0.015444 | 0.019224 | -0.00457 | -0.00455 | -0.00653 |
| 0.012791 | 0.020325 | -0.00579 | -0.00674 | -0.00059 |



|                                  |
|----------------------------------|
| KZ raw material export bill. USD |
| x10                              |
| 32.643                           |
| 50.282                           |
| 30.003                           |
| 41.56                            |
| 63.811                           |
| 64.961                           |
| 63.372                           |
| 59.31                            |
| 30.36                            |
| 22.734                           |
| 31.415                           |
| 43.451                           |
| 40.049                           |
| 30.473                           |
| 39.573                           |
| 58.33                            |

2nd test

|      | KZ Export bill. | Constant | KZT exchange rate | KZ inflation % | GDP of main trading partner | Chinese Yuan exchange | GDP of Turkey bill. | Turkish Lira exchange |
|------|-----------------|----------|-------------------|----------------|-----------------------------|-----------------------|---------------------|-----------------------|
| year | y1              | x1       | x2 1st diff.      | x3             | x4 1st diff.                | x5                    | x6                  | x7                    |
| 2007 | 47.7            | 1        |                   | 10.9           |                             | 7.81                  | 681                 | 1.42                  |
| 2008 | 71.2            | 1        | -6.7              | 17.1           | 1044.01                     | 7.3                   | 770                 | 1.17                  |
| 2009 | 43.2            | 1        | 0.49              | 7.32           | 507.35                      | 6.84                  | 649                 | 1.61                  |
| 2010 | 57.2            | 1        | 27.67             | 7.4            | 985.5                       | 6.83                  | 777                 | 1.46                  |
| 2011 | 88.1            | 1        | -1.73             | 8.42           | 1464.36                     | 6.62                  | 839                 | 1.57                  |
| 2012 | 86.5            | 1        | 2.4               | 5.1            | 980.64                      | 6.3                   | 881                 | 1.88                  |
| 2013 | 84.7            | 1        | 3.07              | 5.85           | 1038.28                     | 6.29                  | 958                 | 1.78                  |
| 2014 | 79.5            | 1        | 26.61             | 6.71           | 905.15                      | 6.1                   | 939                 | 2.17                  |
| 2015 | 46              | 1        | 43.38             | 6.67           | 585.95                      | 6.12                  | 864                 | 2.31                  |
| 2016 | 36.7            | 1        | 119.71            | 14.6           | 171.74                      | 6.51                  | 870                 | 2.99                  |
| 2017 | 48.3            | 1        | -15.73            | 7.44           | 1077.18                     | 6.96                  | 859                 | 3.6                   |
| 2018 | 61              | 1        | 18.92             | 6.02           | 1584.42                     | 6.5                   | 778                 | 3.75                  |
| 2019 | 57.3            | 1        | 37.95             | 5.25           | 385.06                      | 6.86                  | 760                 | 5.39                  |
| 2020 | 46.5            | 1        | 31.04             | 6.77           | 407.77                      | 6.97                  | 720                 | 5.92                  |
| 2021 | 60.6            | 1        | 12.62             | 8.04           | 3132.72                     | 6.47                  | 819                 | 7.37                  |
| 2022 | 84.7            | 1        | 35.01             | 8              | 142.71                      | 6.37                  | 906                 | 13.6                  |

Final

|       |
|-------|
| x10   |
| 0.99  |
| -0.28 |
| -0.23 |
| -0.04 |
| -0.39 |
| 0.56  |
| 0.04  |
| 0.93  |
| -0.40 |
| 1.00  |

|     | y1   | x2 1st diff. | x3    | x4 1st diff. | x5    | x6    | x7    |
|-----|------|--------------|-------|--------------|-------|-------|-------|
| y1  | 1.00 | -0.44        | -0.16 | 0.20         | -0.33 | 0.54  | 0.09  |
| x2  |      | 1.00         | 0.27  | -0.43        | -0.26 | 0.13  | 0.18  |
| x3  |      |              | 1.00  | -0.07        | 0.44  | -0.08 | -0.13 |
| x4  |      |              |       | 1.00         | -0.07 | 0.03  | -0.05 |
| x5  |      |              |       |              | 1.00  | -0.70 | -0.11 |
| x6  |      |              |       |              |       | 1.00  | 0.10  |
| x7  |      |              |       |              |       |       | 1.00  |
| x8  |      |              |       |              |       |       |       |
| x9  |      |              |       |              |       |       |       |
| x10 |      |              |       |              |       |       |       |



| GDP of Russia bill. USD | Russian Ruble exchange | KZraw material |
|-------------------------|------------------------|----------------|
| x8 dummy                | x9                     | x10            |
|                         | 26.3                   | 32.6           |
| 0                       | 24.5                   | 50.3           |
| 0                       | 29.4                   | 30             |
| 0                       | 30.2                   | 41.6           |
| 1                       | 30.4                   | 63.8           |
| 1                       | 32.2                   | 65             |
| 1                       | 30.4                   | 63.4           |
| 1                       | 32.7                   | 59.3           |
| 0                       | 56.2                   | 30.4           |
| 0                       | 72.9                   | 22.7           |
| 0                       | 60.7                   | 31.4           |
| 0                       | 57.6                   | 43.5           |
| 0                       | 69.5                   | 40             |
| 0                       | 61.9                   | 30.5           |
| 1                       | 73.9                   | 39.6           |
| 1                       | 74.3                   | 58.3           |

| KZT exchange rate | GDP of Russia bill. USD | GDP of main trading partner |
|-------------------|-------------------------|-----------------------------|
| x2                | x8                      | x4                          |
| 127               | 1299.7                  | 3550.33                     |
| 120.3             | 1660.85                 | 4594.34                     |
| 120.79            | 1222.65                 | 5101.69                     |
| 148.46            | 1524.92                 | 6087.19                     |
| 146.73            | 2045.92                 | 7551.55                     |
| 149.13            | 2208.29                 | 8532.19                     |
| 152.2             | 2292.47                 | 9570.47                     |
| 178.81            | 2059.24                 | 10475.62                    |
| 222.19            | 1363.48                 | 11061.57                    |
| 341.9             | 1276.79                 | 11233.31                    |
| 326.17            | 1574.2                  | 12310.49                    |
| 345.09            | 1657.33                 | 13894.91                    |
| 383.04            | 1693.11                 | 14279.97                    |
| 414.08            | 1493.08                 | 14687.74                    |
| 426.7             | 1836.89                 | 17820.46                    |
| 461.71            | 2240.42                 | 17963.17                    |

| x8 dummy | x9    | x10   |
|----------|-------|-------|
| 0.82     | -0.42 | 0.99  |
| -0.24    | 0.53  | -0.45 |
| -0.26    | -0.05 | -0.20 |
| 0.36     | -0.02 | 0.18  |
| -0.59    | -0.09 | -0.34 |
| 0.65     | 0.03  | 0.53  |
| 0.25     | 0.73  | 0.00  |
| 1.00     | -0.15 | 0.80  |
|          | 1.00  | -0.49 |
|          |       | 1.00  |

x8 dummy 1743.309 0

x10 dummy 44.6456





| GDP of Tur<br>x8 | TUR exch<br>x9 | TUR infatior<br>x10 | GDP of RU<br>x11 | RU exch<br>x12 | RU infatior<br>x13 | KZ raw material export bil USD<br>x14 |
|------------------|----------------|---------------------|------------------|----------------|--------------------|---------------------------------------|
| 681.32           | 1.41875        | 8.76                | 1299.7           | 26.3311        | 9.01               | 32.643                                |
| 770.45           | 1.16864        | 10.44               | 1660.85          | 24.5462        | 14.11              | 50.282                                |
| 649.29           | 1.60892        | 6.25                | 1222.65          | 29.3916        | 11.65              | 30.003                                |
| 776.97           | 1.45542        | 8.57                | 1524.92          | 30.1851        | 6.85               | 41.56                                 |
| 838.79           | 1.56578        | 6.47                | 2045.92          | 30.3505        | 8.44               | 63.811                                |
| 880.56           | 1.881275       | 8.89                | 2208.29          | 32.1961        | 5.07               | 64.961                                |
| 957.8            | 1.7762         | 7.49                | 2292.47          | 30.3727        | 6.75               | 63.372                                |
| 938.93           | 2.17448        | 8.85                | 2059.24          | 32.6587        | 7.82               | 59.31                                 |
| 864.31           | 2.314539       | 7.67                | 1363.48          | 56.2376        | 15.53              | 30.36                                 |
| 869.68           | 2.99268        | 7.78                | 1276.79          | 72.9299        | 7.04               | 22.734                                |
| 858.99           | 3.59825        | 11.14               | 1574.2           | 60.6569        | 3.68               | 31.415                                |
| 778.48           | 3.75345        | 16.33               | 1657.33          | 57.6002        | 2.88               | 43.451                                |
| 759.93           | 5.39474        | 15.18               | 1693.11          | 69.4706        | 4.47               | 40.049                                |
| 720.29           | 5.924539       | 12.28               | 1493.08          | 61.9057        | 3.38               | 30.473                                |
| 819.03           | 7.365          | 19.6                | 1836.89          | 73.8757        | 6.69               | 39.573                                |
| 905.99           | 13.6105        | 72.31               | 2240.42          | 74.2926        | 7                  | 58.33                                 |

./TradeFlow/Export/Indicator/XPRT-TRD-VL/Partner/WLD/Product/UNCTAD-SoP1

| x9       | x10      | x11      | x12      | x13      | x14      |
|----------|----------|----------|----------|----------|----------|
| 0.126559 | 0.305697 | 0.944275 | -0.32741 | -0.07745 | 0.993691 |
| 0.380014 | 0.344519 | 0.866888 | 0.210056 | -0.30564 | 0.69462  |
| 0.836658 | 0.588669 | 0.033529 | 0.955171 | -0.52826 | -0.2816  |
| -0.16322 | -0.05529 | -0.34048 | -0.10741 | 0.452353 | -0.23097 |
| 0.822652 | 0.587046 | 0.29112  | 0.889566 | -0.50281 | -0.03632 |
| -0.20186 | -0.17117 | -0.51725 | -0.26143 | 0.054724 | -0.3895  |
| -0.28289 | -0.12914 | 0.16908  | -0.43158 | 0.134455 | 0.362965 |
| 0.166561 | 0.227219 | 0.704205 | 0.146157 | -0.09994 | 0.558546 |
| 1        | 0.913245 | 0.300263 | 0.74181  | -0.32229 | 0.040321 |
|          | 1        | 0.390669 | 0.492747 | -0.14894 | 0.229757 |
|          |          | 1        | -0.08547 | -0.27071 | 0.927218 |
|          |          |          | 1        | -0.3908  | -0.40078 |
|          |          |          |          | 1        | -0.07606 |
|          |          |          |          |          | 1        |

$(X^T X)^{-1}$

$(X^T X)^{-1}$

OLSM (XT\*X)^-1\*XT\*Y

|           |          |          |          |          |          |          |          |          |
|-----------|----------|----------|----------|----------|----------|----------|----------|----------|
| XT        | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        |
|           | 104.85   | 133.44   | 115.31   | 148.05   | 192.63   | 208      | 236.63   | 221.42   |
|           | 127      | 120.3    | 120.79   | 148.46   | 146.73   | 149.13   | 152.2    | 178.81   |
|           | 10.85    | 17.14    | 7.32     | 7.4      | 8.42     | 5.1      | 5.85     | 6.71     |
|           | 3550.33  | 4594.34  | 5101.69  | 6087.19  | 7551.55  | 8532.19  | 9570.47  | 10475.62 |
|           | 7.8073   | 7.2996   | 6.8367   | 6.8281   | 6.6215   | 6.3001   | 6.2897   | 6.099    |
|           | 4.82     | 5.93     | -0.73    | 3.18     | 5.55     | 2.62     | 2.62     | 1.92     |
|           | 681.32   | 770.45   | 649.29   | 776.97   | 838.79   | 880.56   | 957.8    | 938.93   |
|           | 1.41875  | 1.16864  | 1.60892  | 1.45542  | 1.56578  | 1.881275 | 1.7762   | 2.17448  |
|           | 8.76     | 10.44    | 6.25     | 8.57     | 6.47     | 8.89     | 7.49     | 8.85     |
|           | 1299.7   | 1660.85  | 1222.65  | 1524.92  | 2045.92  | 2208.29  | 2292.47  | 2059.24  |
|           | 26.3311  | 24.5462  | 29.3916  | 30.1851  | 30.3505  | 32.1961  | 30.3727  | 32.6587  |
|           | 9.01     | 14.11    | 11.65    | 6.85     | 8.44     | 5.07     | 6.75     | 7.82     |
|           | 32.643   | 50.282   | 30.003   | 41.56    | 63.811   | 64.961   | 63.372   | 59.31    |
| XT*X      | 16       | 2798.63  | 4064.3   | 131.53   | 168715   | 106.8344 | 41.28    | 13070.81 |
|           | 2798.63  | 512037.6 | 730766.9 | 21926.88 | 30998152 | 18483.36 | 7087.642 | 2327683  |
|           | 4064.3   | 730766.9 | 1271308  | 32408.32 | 50791954 | 26979.13 | 9333.921 | 3336383  |
|           | 131.53   | 21926.88 | 32408.32 | 1245.82  | 1306885  | 888.6059 | 378.6722 | 106752.1 |
|           | 168715   | 30998152 | 50791954 | 1306885  | 2.08E+09 | 1112295  | 385982.5 | 1.4E+08  |
|           | 106.8344 | 18483.36 | 26979.13 | 888.6059 | 1112295  | 716.3899 | 281.0719 | 86828.01 |
|           | 41.28    | 7087.642 | 9333.921 | 378.6722 | 385982.5 | 281.0719 | 149.2546 | 33619.61 |
|           | 13070.81 | 2327683  | 3336383  | 106752.1 | 1.4E+08  | 86828.01 | 33619.61 | 10796184 |
|           | 58.00316 | 10859.47 | 19853.41 | 450.6096 | 790587.8 | 382.8894 | 126.4915 | 48101.48 |
|           | 228.01   | 43072.63 | 75675.3  | 1830.613 | 3033834  | 1504.038 | 536.1574 | 191090.3 |
|           | 27449.34 | 4982381  | 6995462  | 219570.1 | 2.96E+08 | 182027.7 | 72358.39 | 22761274 |
|           | 763.0012 | 135849.2 | 229205.8 | 6167.901 | 9217353  | 5060.118 | 1754.638 | 627125.9 |
|           | 120.37   | 20407.86 | 26936.12 | 1071.325 | 1146086  | 805.0738 | 322.9486 | 97848.72 |
|           | 702.327  | 128586.7 | 170825.3 | 5610.412 | 7371064  | 4652.144 | 1942.687 | 584327.7 |
| (XT*X)^-1 | 1179.33  | -3.32145 | 1.341682 | -13.0004 | -0.00482 | -165.297 | 24.40785 | -0.06173 |
|           | -3.32145 | 0.033894 | -0.01589 | 0.15581  | 8.37E-05 | 0.768832 | -0.09441 | -0.00363 |
|           | 1.341682 | -0.01589 | 0.010378 | -0.08363 | -8.8E-05 | -0.38285 | 0.033539 | 0.001804 |
|           | -13.0004 | 0.15581  | -0.08363 | 0.773292 | 0.000574 | 3.450745 | -0.38579 | -0.01796 |
|           | -0.00482 | 8.37E-05 | -8.8E-05 | 0.000574 | 1.15E-06 | 0.00234  | -4.3E-05 | -1.1E-05 |
|           | -165.297 | 0.768832 | -0.38285 | 3.450745 | 0.00234  | 27.73922 | -3.657   | -0.03883 |
|           | 24.40785 | -0.09441 | 0.033539 | -0.38579 | -4.3E-05 | -3.657   | 0.618253 | 0.002751 |
|           | -0.06173 | -0.00363 | 0.001804 | -0.01796 | -1.1E-05 | -0.03883 | 0.002751 | 0.000672 |
|           | -27.9868 | 0.184605 | -0.12041 | 0.938748 | 0.000873 | 5.751244 | -0.6302  | -0.00905 |
|           | 2.587168 | -0.00312 | 0.003012 | -0.01509 | -1.4E-05 | -0.33729 | 0.049045 | -0.00147 |
|           | 0.634728 | -0.00376 | 0.002001 | -0.01761 | -1.3E-05 | -0.11862 | 0.014971 | 0.000219 |
|           | -5.53947 | 0.048401 | -0.02679 | 0.23363  | 0.000175 | 1.245515 | -0.14169 | -0.00497 |
|           | 10.93973 | -0.13651 | 0.08112  | -0.6951  | -0.00062 | -3.10548 | 0.305984 | 0.015231 |
|           | -12.1362 | 0.042972 | -0.02172 | 0.189618 | 0.000119 | 1.877087 | -0.27009 | 0.000229 |

|    |          |          |          |          |          |          |          |          |
|----|----------|----------|----------|----------|----------|----------|----------|----------|
| XT | -7.17564 | -0.22904 | -1.63904 | 14.91892 | 0.99753  | 10.07974 | 1.816193 | -19.2296 |
|    | 0.071345 | -0.03828 | 0.005303 | -0.05079 | -0.0227  | -0.05822 | 0.061382 | 0.05685  |
|    | -0.05393 | 0.032247 | 0.005977 | 0.012271 | 0.005007 | 0.023064 | -0.01479 | -0.03006 |
|    | 0.374146 | -0.16706 | 0.004532 | -0.20184 | -0.10785 | -0.25541 | 0.246431 | 0.268346 |
|    | 0.000512 | -0.00024 | -0.00019 | 3E-05    | -4.9E-05 | -0.00018 | -5.2E-05 | 0.00026  |
|    | 2.047852 | -0.65828 | 0.270826 | -1.99746 | -0.33716 | -1.76287 | 0.214731 | 2.819655 |
|    | -0.06418 | 0.024616 | -0.24429 | 0.35276  | 0.100972 | 0.195197 | -0.02906 | -0.43415 |
|    | -0.00809 | 0.003246 | -0.00109 | 0.003942 | 0.004639 | 0.003006 | -0.0126  | 0.005085 |
|    | 0.587006 | -0.53737 | 0.009982 | -0.09485 | 0.214212 | -0.33548 | -0.19934 | 0.818908 |
|    | -0.00631 | 0.026729 | -0.00888 | 0.007499 | -0.04317 | 0.010946 | 0.057018 | -0.08056 |
|    | -0.00877 | 0.005728 | -0.0007  | 0.005485 | -0.0006  | 0.008255 | 0.001252 | -0.01467 |
|    | 0.124967 | -0.07809 | 0.005856 | -0.07645 | -0.00871 | -0.06013 | 0.047637 | 0.076612 |
|    | -0.40092 | 0.270548 | 0.038671 | 0.090497 | 0.057649 | 0.195279 | -0.15639 | -0.26223 |
|    | 0.071708 | -0.05107 | 0.038731 | -0.10811 | 0.050593 | -0.1043  | -0.1052  | 0.269897 |

XT\*Y

|     |          |                                   |
|-----|----------|-----------------------------------|
| x1  | 16.74082 | Constant                          |
| x2  | -0.31764 | GDP kz                            |
| x3  | 0.087957 | KZ exchange rat                   |
| x4  | -1.12008 | KZ inflation %                    |
| x5  | 0.000376 | GDP of main trading partner China |
| x6  | -4.59349 | CH exchange                       |
| x7  | 1.11875  | CH inflation %                    |
| x8  | 0.036502 | GDP of Turkey                     |
| x9  | -0.50229 | TUR exch                          |
| x10 | -0.05669 | TUR inflation %                   |
| x11 | 0.030028 | GDP of RU                         |
| x12 | -0.32864 | RU exch                           |
| x13 | 1.152248 | RU inflation %                    |
| x14 | 0.916672 | KZ raw material export bil USD    |

|          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|
| 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        |
| 184.39   | 137.28   | 166.81   | 179.34   | 181.67   | 171.08   | 197.11   | 220.62   |
| 222.19   | 341.9    | 326.17   | 345.09   | 383.04   | 414.08   | 426.7    | 461.71   |
| 6.67     | 14.55    | 7.44     | 6.02     | 5.25     | 6.77     | 8.04     | 8        |
| 11061.57 | 11233.31 | 12310.49 | 13894.91 | 14279.97 | 14687.74 | 17820.46 | 17963.17 |
| 6.1248   | 6.5126   | 6.9552   | 6.4959   | 6.8557   | 6.97     | 6.4682   | 6.37     |
| 1.44     | 2        | 1.59     | 2.07     | 2.9      | 2.42     | 0.98     | 1.97     |
| 864.31   | 869.68   | 858.99   | 778.48   | 759.93   | 720.29   | 819.03   | 905.99   |
| 2.314539 | 2.99268  | 3.59825  | 3.75345  | 5.39474  | 5.924539 | 7.365    | 13.6105  |
| 7.67     | 7.78     | 11.14    | 16.33    | 15.18    | 12.28    | 19.6     | 72.31    |
| 1363.48  | 1276.79  | 1574.2   | 1657.33  | 1693.11  | 1493.08  | 1836.89  | 2240.42  |
| 56.2376  | 72.9299  | 60.6569  | 57.6002  | 69.4706  | 61.9057  | 73.8757  | 74.2926  |
| 15.53    | 7.04     | 3.68     | 2.88     | 4.47     | 3.38     | 6.69     | 7        |
| 30.36    | 22.734   | 31.415   | 43.451   | 40.049   | 30.473   | 39.573   | 58.33    |

|          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|
| 58.00316 | 228.01   | 27449.34 | 763.0012 | 120.37   | 702.327  |
| 10859.47 | 43072.63 | 4982381  | 135849.2 | 20407.86 | 128586.7 |
| 19853.41 | 75675.3  | 6995462  | 229205.8 | 26936.12 | 170825.3 |
| 450.6096 | 1830.613 | 219570.1 | 6167.901 | 1071.325 | 5610.412 |
| 790587.8 | 3033834  | 2.96E+08 | 9217353  | 1146086  | 7371064  |
| 382.8894 | 1504.038 | 182027.7 | 5060.118 | 805.0738 | 4652.144 |
| 126.4915 | 536.1574 | 72358.39 | 1754.638 | 322.9486 | 1942.687 |
| 48101.48 | 191090.3 | 22761274 | 627125.9 | 97848.72 | 584327.7 |
| 367.0009 | 1532.149 | 104742.5 | 3469.99  | 379.4826 | 2573.87  |
| 1532.149 | 7057.807 | 424734.8 | 13178.31 | 1585.764 | 10789.37 |
| 104742.5 | 424734.8 | 49029793 | 1299973  | 201191.6 | 1275982  |
| 3469.99  | 13178.31 | 1299973  | 42131.65 | 5322.523 | 31819.38 |
| 379.4826 | 1585.764 | 201191.6 | 5322.523 | 1104.311 | 5224.651 |
| 2573.87  | 10789.37 | 1275982  | 31819.38 | 5224.651 | 33861.11 |

|          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|
| -27.9868 | 2.587168 | 0.634728 | -5.53947 | 10.93973 | -12.1362 |
| 0.184605 | -0.00312 | -0.00376 | 0.048401 | -0.13651 | 0.042972 |
| -0.12041 | 0.003012 | 0.002001 | -0.02679 | 0.08112  | -0.02172 |
| 0.938748 | -0.01509 | -0.01761 | 0.23363  | -0.6951  | 0.189618 |
| 0.000873 | -1.4E-05 | -1.3E-05 | 0.000175 | -0.00062 | 0.000119 |
| 5.751244 | -0.33729 | -0.11862 | 1.245515 | -3.10548 | 1.877087 |
| -0.6302  | 0.049045 | 0.014971 | -0.14169 | 0.305984 | -0.27009 |
| -0.00905 | -0.00147 | 0.000219 | -0.00497 | 0.015231 | 0.000229 |
| 2.257427 | -0.15766 | -0.03176 | 0.323094 | -0.96118 | 0.463677 |
| -0.15766 | 0.019855 | 0.001828 | -0.00973 | 0.02252  | -0.04014 |
| -0.03176 | 0.001828 | 0.000588 | -0.00601 | 0.016593 | -0.0088  |
| 0.323094 | -0.00973 | -0.00601 | 0.080211 | -0.21624 | 0.075286 |
| -0.96118 | 0.02252  | 0.016593 | -0.21624 | 0.663794 | -0.1803  |
| 0.463677 | -0.04014 | -0.0088  | 0.075286 | -0.1803  | 0.160634 |



|          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|
| 4.770283 | 1.307251 | -6.75325 | 4.403035 | -15.6085 | 8.226008 | 5.109119 | 0.00704  |
| -0.01868 | 0.039947 | -0.08832 | 0.019057 | 0.056053 | -0.0181  | -0.01571 | 0.00087  |
| 0.009883 | -0.01822 | 0.045915 | -0.01281 | -0.01365 | 0.031761 | -0.02566 | 0.002991 |
| -0.14501 | 0.238045 | -0.45382 | 0.131203 | 0.151499 | -0.15447 | 0.084736 | -0.01348 |
| -2.5E-05 | -3.3E-05 | -0.00026 | 0.000315 | -0.00016 | -0.00041 | 0.000564 | -9.1E-05 |
| -0.8368  | 0.194943 | -0.38878 | -0.0107  | 2.205135 | -1.4149  | -0.26543 | -0.08075 |
| 0.185324 | -0.07961 | 0.001875 | 0.026735 | -0.32526 | 0.141647 | 0.156351 | -0.00893 |
| 0.001196 | -0.00457 | 0.016303 | -0.00758 | -0.00321 | 0.00147  | -0.00243 | 0.000684 |
| -0.25901 | 0.289729 | -0.517   | -0.39385 | 0.273521 | -0.14883 | 0.274754 | 0.017627 |
| 0.024133 | -0.01159 | -0.00226 | 0.070857 | -0.02864 | -0.00794 | -0.02102 | 0.013174 |
| 0.003345 | -0.00386 | 0.007233 | -0.0009  | -0.00769 | 0.004697 | 0.001225 | -1.4E-05 |
| -0.03089 | 0.069755 | -0.11828 | 0.021273 | 0.106376 | -0.09425 | 0.017712 | -0.00339 |
| 0.146563 | -0.20426 | 0.388761 | -0.12583 | -0.12206 | 0.172512 | -0.10241 | 0.013607 |
| -0.07142 | 0.031448 | -0.03324 | -0.01668 | 0.158758 | -0.08776 | -0.04435 | 0.000987 |

| year | KZ NX bil USD<br>y | constant<br>x1 | exch r kzt<br>x2 | GDP of kz<br>x3 | GDP of main tr<br>x4 1st diff | trading p. Chi<br>x4 |
|------|--------------------|----------------|------------------|-----------------|-------------------------------|----------------------|
| 2007 | 15.061             | 1              | 127              | 104.85          | #HODNOTA!                     | 3550.33              |
| 2008 | 33.357             | 1              | 120.3            | 133.44          | 1044.01                       | 4594.34              |
| 2009 | 14.787             | 1              | 120.79           | 115.31          | 507.35                        | 5101.69              |
| 2010 | 33.22              | 1              | 148.46           | 148.05          | 985.5                         | 6087.19              |
| 2011 | 50.098             | 1              | 146.73           | 192.63          | 1464.36                       | 7551.55              |
| 2012 | 41.912             | 1              | 149.13           | 208             | 980.64                        | 8532.19              |
| 2013 | 35.895             | 1              | 152.2            | 236.63          | 1038.28                       | 9570.47              |
| 2014 | 38.165             | 1              | 178.81           | 221.42          | 905.15                        | 10475.62             |
| 2015 | 15.393             | 1              | 222.19           | 184.39          | 585.95                        | 11061.57             |
| 2016 | 11.515             | 1              | 341.9            | 137.28          | 171.74                        | 11233.31             |
| 2017 | 18.701             | 1              | 326.17           | 166.81          | 1077.18                       | 12310.49             |
| 2018 | 27.613             | 1              | 345.09           | 179.34          | 1584.42                       | 13894.91             |
| 2019 | 17.601             | 1              | 383.04           | 181.67          | 385.06                        | 14279.97             |
| 2020 | 7.522              | 1              | 414.08           | 171.08          | 407.77                        | 14687.74             |
| 2021 | 19.205             | 1              | 426.7            | 197.11          | 3132.72                       | 17820.46             |
| 2022 | 35.07              | 1              | 461.71           | 220.62          | 142.71                        | 17963.17             |

#### KZ import

|      |        |
|------|--------|
| 2007 | 32.687 |
| 2008 | 37.815 |
| 2009 | 28.409 |
| 2010 | 24.024 |
| 2011 | 38.01  |
| 2012 | 44.538 |
| 2013 | 48.805 |
| 2014 | 41.295 |
| 2015 | 30.567 |
| 2016 | 25.175 |
| 2017 | 29.599 |
| 2018 | 33.347 |
| 2019 | 39.709 |
| 2020 | 38.928 |
| 2021 | 41.415 |
| 2022 | 49.59  |

<https://www.statista.com/statistics/436206/import-of-goods-to-kazakhstan/#:~:text=The%20statistic%20sho>

| Statistical Significance testing of KZ NX |             |          |             |             |
|---|-------------|----------|-------------|-------------|
|   | x1          | x2       | x3          | x4 1st diff |
| Matrix (XTX)-1                            | 2.050644803 | 4.64E-06 | 6.18938E-05 | 1.35721E-07 |
| sii                                       | 4.101289607 | 9.28E-06 | 0.000123788 | 2.71442E-07 |
| sbi                                       | 2.025164094 | 0.003047 | 0.011125985 | 0.000521001 |
| abs par val                               | 3.978510535 | 0.06021  | 0.204285813 | 0.001883028 |
| t value                                   | 1.964537366 | 19.76237 | 18.36114326 | 3.61425201  |

|              |            |            |             |             |
|--------------|------------|------------|-------------|-------------|
| crit t value | 2.145      | 2.145      | 2.145       | 2.145       |
| comparison   | 1.96<2.145 | 19.76>2.14 | 18.36>2.145 | 3.614>2.145 |
| SS or SI     | SI         | SS         | SS          | SS          |

|                | x1  | x2                  | x3                  | x4                  |
|----------------|---|---------------------|---------------------|---------------------|
| Matrix (XTX)-1 | diag var.   | diag var.           | diag var.           | diag var.           |
| sii            | diag var.*2   | diag var.*3         | diag var.*4         | diag var.*5         |
| sbi            | (diag var. * 2)^0.5   | (diag var. * 3)^0.5 | (diag var. * 4)^0.5 | (diag var. * 5)^0.5 |
| abs par val    | Absolute value of   | 0                   | 0                   | #HODNOTA!           |
| t value        | Abs. par. Val/ sbi  | #####               | #HODNOTA!           | #HODNOTA!           |
| crit t value   | identify Critical t value based on degrees of freedom and alpha | 2.145               | 2.145               | 2.145               |
| comparison     | compare t value a   | 19.76>2.14          | 18.36>2.145         | 3.614>2.145         |
| SS or SI       | Identify significant  | SS                  | SS                  | SS                  |

|      | KZ NX bil USD | constant | exchange rate of KZT/USD | GDP of KZ | GDP of main trading partner China in bil. USD |
|------|---------------|----------|--------------------------|-----------|---|
| year | y             | x1       | x2                       | x3        | x4  |
| 2007 | 15.061        | 1        | 127                      | 104.85    | 3550.33                                       |
| 2008 | 33.357        | 1        | 120.3                    | 133.44    | 4594.34                                       |
| 2009 | 14.787        | 1        | 120.79                   | 115.31    | 5101.69                                       |
| 2010 | 33.22         | 1        | 148.46                   | 148.05    | 6087.19                                       |
| 2011 | 50.098        | 1        | 146.73                   | 192.63    | 7551.55                                       |
| 2012 | 41.912        | 1        | 149.13                   | 208       | 8532.19                                       |
| 2013 | 35.895        | 1        | 152.2                    | 236.63    | 9570.47                                       |
| 2014 | 38.165        | 1        | 178.81                   | 221.42    | 10475.62                                      |
| 2015 | 15.393        | 1        | 222.19                   | 184.39    | 11061.57                                      |
| 2016 | 11.515        | 1        | 341.9                    | 137.28    | 11233.31                                      |
| 2017 | 18.701        | 1        | 326.17                   | 166.81    | 12310.49                                      |
| 2018 | 27.613        | 1        | 345.09                   | 179.34    | 13894.91                                      |
| 2019 | 17.601        | 1        | 383.04                   | 181.67    | 14279.97                                      |
| 2020 | 7.522         | 1        | 414.08                   | 171.08    | 14687.74                                      |
| 2021 | 19.205        | 1        | 426.7                    | 197.11    | 17820.46                                      |
| 2022 | 35.07         | 1        | 461.71                   | 220.62    | 17963.17                                      |

na bil USD

OLSM  $(X^T X)^{-1} X^T Y$

|    |         |        |        |         |        |         |
|----|---------|--------|--------|---------|--------|---------|
| XT | 1       | 1      | 1      | 1       | 1      | 1       |
|    | 120.3   | 120.79 | 148.46 | 146.73  | 149.13 | 152.2   |
|    | 133.44  | 115.31 | 148.05 | 192.63  | 208    | 236.63  |
|    | 1044.01 | 507.35 | 985.5  | 1464.36 | 980.64 | 1038.28 |

$X^T X$

|  |          |         |          |          |
|--|----------|---------|----------|----------|
|  | 15       | 3937.3  | 2693.78  | 14412.84 |
|  | 3937.3   | 1255179 | 717451   | 3820155  |
|  | 2693.78  | 717451  | 501044.1 | 2660022  |
|  | 14412.84 | 3820155 | 2660022  | 21514282 |

$(X^T X)^{-1}$

|  |          |          |          |          |
|--|----------|----------|----------|----------|
|  | 2.050645 | -0.00072 | -0.00984 | -3E-05   |
|  | -0.00072 | 4.64E-06 | -2.8E-06 | 3.8E-09  |
|  | -0.00984 | -2.8E-06 | 6.19E-05 | -5.7E-07 |
|  | -3E-05   | 3.8E-09  | -5.7E-07 | 1.36E-07 |

$(X^T X)^{-1} X^T$

|  |          |          |          |          |          |          |
|--|----------|----------|----------|----------|----------|----------|
|  | 0.620327 | 0.814356 | 0.458115 | 0.00652  | -0.13194 | -0.4175  |
|  | -0.00053 | -0.00048 | -0.00044 | -0.00057 | -0.00061 | -0.00067 |
|  | -0.0025  | -0.00333 | -0.00165 | 0.000847 | 0.002065 | 0.003796 |
|  | 3.68E-05 | -2.6E-05 | 2.07E-05 | 6.05E-05 | -1.4E-05 | -2.2E-05 |

$(X^T X)^{-1} X^T Y$

|    |          |              |
|----|----------|--------------|
| x1 | 3.978511 | constant     |
| x2 | -0.06021 | exch r KZT   |
| x3 | 0.204286 | GDP of KZ    |
| x4 | 0.001883 | GDP of China |

ws%20the%20value,dollars%20were%20imported%20to%20Kazakhstan.

Correlation testing 1

| Variables | y        | x2       | x3       | x4    |
|-----------|----------|----------|----------|-------|
| y         | 1        | -0.40876 | 0.529843 | ##### |
| x2        | -0.40876 | 1        | 0.270813 | ##### |
| x3        | 0.529843 | 0.270813 | 1        | ##### |
| x4        | #####    | #####    | #####    | 1     |

## Correlation testing 2

| Variables   | y        | x2       | x3       | x4 1st diff |
|-------------|----------|----------|----------|-------------|
| y           | 1        | -0.50264 | 0.490544 | 0.205676    |
| x2          | -0.50264 | 1        | 0.167536 | 0.028365    |
| x3          | 0.490544 | 0.167536 | 1        | 0.196965    |
| x4 1st diff | 0.205676 | 0.028365 | 0.196965 | 1           |

|        |        |        |         |         |        |        |         |        |
|--------|--------|--------|---------|---------|--------|--------|---------|--------|
| 1      | 1      | 1      | 1       | 1       | 1      | 1      | 1       | 1      |
| 178.81 | 222.19 | 341.9  | 326.17  | 345.09  | 383.04 | 414.08 | 426.7   | 461.71 |
| 221.42 | 184.39 | 137.28 | 166.81  | 179.34  | 181.67 | 171.08 | 197.11  | 220.62 |
| 905.15 | 585.95 | 171.74 | 1077.18 | 1584.42 | 385.06 | 407.77 | 3132.72 | 142.71 |

|          |          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| -0.28303 | 0.059578 | 0.44931  | 0.143076 | -0.00894 | -0.0233  | 0.057879 | -0.28868 | -0.45576 |
| -0.00051 | -0.0002  | 0.000484 | 0.000332 | 0.000386 | 0.000551 | 0.000725 | 0.000721 | 0.000807 |
| 0.002855 | 0.000622 | -0.00239 | -0.00103 | -0.0006  | 0.000117 | -0.00064 | -0.0006  | 0.002444 |
| -3.2E-05 | -5.4E-05 | -8.3E-05 | 2.33E-05 | 8.51E-05 | -7.9E-05 | -7E-05   | 0.000285 | -0.00013 |



gretl: model 1

File Edit Tests Save Graphs Analysis LaTeX

Model 1: OLS, using observations 2008-  
 Dependent variable: y

|       | coefficient | std. error |
|-------|-------------|------------|
| const | 3.97851     | 12.8080    |
| x2    | -0.0602099  | 0.0192686  |
| x3    | 0.204286    | 0.0703654  |

x4\_Diff            0.00188303            0.00329500

|                    |           |          |
|--------------------|-----------|----------|
| Mean dependent var | 26.67027  | S.D. of  |
| Sum squared resid  | 879.9625  | S.E. of  |
| R-squared          | 0.604274  | Adjusted |
| F(3, 11)           | 5.599009  | P-value  |
| Log-likelihood     | -51.82280 | Akaike   |
| Schwarz criterion  | 114.4778  | Hannan   |
| rho                | 0.017279  | Durbin   |

Excluding the constant, p-value was h:

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-2022 (T = 15)

| t-ratio | p-value |  |
|---------|---------|--|
|---------|---------|--|

---

|        |        |  |
|--------|--------|--|
| 0.3106 | 0.7619 |  |
|--------|--------|--|

|        |        |     |
|--------|--------|-----|
| -3.125 | 0.0097 | *** |
|--------|--------|-----|

|       |        |    |
|-------|--------|----|
| 2.903 | 0.0144 | ** |
|-------|--------|----|



3      0.5715      0.5792

|               |          |
|---------------|----------|
| dependent var | 12.60291 |
| of regression | 8.944081 |
| ted R-squared | 0.496349 |
| ue (F)        | 0.014040 |
| e criterion   | 111.6456 |
| n-Quinn       | 111.6154 |
| n-Watson      | 1.701760 |

ighest for variable 5 (x4\_Diff)

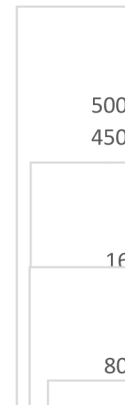
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|      | KZ Export<br>bil USD | constant | exchange<br>rate of<br>KZT/USD | GDP of KZ | GDP of<br>main<br>export<br>destinatio<br>n China in<br>Bil USD | top export | top exported item 2 |
|------|----------------------|----------|--------------------------------|-----------|---|------------|---------------------|
| year | y                    | x1       | x2                             | x3        | x4  | x5         | x6                  |
| 2007 | 47.748               | 1        | 127                            | 104.85    | 3550.33   |            |                     |
| 2008 | 71.172               | 1        | 120.3                          | 133.44    | 4594.34   |            |                     |
| 2009 | 43.196               | 1        | 120.79                         | 115.31    | 5101.69   |            |                     |
| 2010 | 57.244               | 1        | 148.46                         | 148.05    | 6087.19   |            |                     |
| 2011 | 88.108               | 1        | 146.73                         | 192.63    | 7551.55   |            |                     |
| 2012 | 86.45                | 1        | 149.13                         | 208       | 8532.19   |            |                     |
| 2013 | 84.7                 | 1        | 152.2                          | 236.63    | 9570.47   |            |                     |
| 2014 | 79.46                | 1        | 178.81                         | 221.42    | 10475.62  |            |                     |
| 2015 | 45.96                | 1        | 222.19                         | 184.39    | 11061.57  |            |                     |
| 2016 | 36.69                | 1        | 341.9                          | 137.28    | 11233.31  |            |                     |
| 2017 | 48.3                 | 1        | 326.17                         | 166.81    | 12310.49  |            |                     |
| 2018 | 60.96                | 1        | 345.09                         | 179.34    | 13894.91  |            |                     |
| 2019 | 57.31                | 1        | 383.04                         | 181.67    | 14279.97  |            |                     |
| 2020 | 46.45                | 1        | 414.08                         | 171.08    | 14687.74  |            |                     |
| 2021 | 60.62                | 1        | 426.7                          | 197.11    | 17820.46  |            |                     |
| 2022 | 84.66                | 1        | 461.71                         | 220.62    | 17963.17  |            |                     |

<https://wits.worldbank.org/CountryProfile/en/Country/KAZ/Year/2011/Summarytext>

| year | KZT exchange rate per USD | Turkish Lira exchange rate per USD | Russian Ruble exchange rate per USD | Chinese Yuan exchange rate per USD |
|------|---------------------------|------------------------------------|-------------------------------------|------------------------------------|
| 2007 | 127                       | 1.41875                            | 26.3311                             | 7.8073                             |
| 2008 | 120.3                     | 1.16864                            | 24.5462                             | 7.2996                             |
| 2009 | 120.79                    | 1.60892                            | 29.3916                             | 6.8367                             |
| 2010 | 148.46                    | 1.45542                            | 30.1851                             | 6.8281                             |
| 2011 | 146.73                    | 1.56578                            | 30.3505                             | 6.6215                             |
| 2012 | 149.13                    | 1.881275                           | 32.1961                             | 6.3001                             |
| 2013 | 152.2                     | 1.7762                             | 30.3727                             | 6.2897                             |
| 2014 | 178.81                    | 2.17448                            | 32.6587                             | 6.099                              |
| 2015 | 222.19                    | 2.314539                           | 56.2376                             | 6.1248                             |
| 2016 | 341.9                     | 2.99268                            | 72.9299                             | 6.5126                             |
| 2017 | 326.17                    | 3.59825                            | 60.6569                             | 6.9552                             |
| 2018 | 345.09                    | 3.75345                            | 57.6002                             | 6.4959                             |
| 2019 | 383.04                    | 5.39474                            | 69.4706                             | 6.8557                             |
| 2020 | 414.08                    | 5.924539                           | 61.9057                             | 6.97                               |
| 2021 | 426.7                     | 7.365                              | 73.8757                             | 6.4682                             |
| 2022 | 461.71                    | 13.6105                            | 74.2926                             | 6.37                               |



|                          |          |
|--------------------------|----------|
| <b>3 With Variables:</b> | Turk exc |
| <b>1 Variables:</b>      | KZ exc   |

| Pearson Correlation C |  |
|-----------------------|--|
| Turk exch             |  |
| Turk exch             |  |
| Russ exch             |  |
| Russ exch             |  |
| China exch            |  |
| China exch            |  |

AVG rate KZT/USD  
TURK non avg

- <https://www.poundsterlinglive.com/bank-of-england-spot/historical-spot/>
- [https://www.cbr.ru/eng/currency\\_base/daily/?UniDbQuery.Posted=True](https://www.cbr.ru/eng/currency_base/daily/?UniDbQuery.Posted=True)
- <https://nationalbank.kz/en/exchangerates/ezhednevnye-oficialnye-rynochnye-kursy-valyut/rep>
- [https://www.imf.org/external/np/fin/data/rms\\_mth.aspx?SelectDate=2007-01-31&reportType](https://www.imf.org/external/np/fin/data/rms_mth.aspx?SelectDate=2007-01-31&reportType)

Correlation Coefficients testing of selected countries with Kazakh Tenge

| Currency      | Kazakh Tenge |
|---------------|--------------|
| Turkish Lira  | 0.83666      |
| Russian Ruble | 0.95517      |
| Chinese Yuan  | -0.18634     |

### KZ Tenge



### Turkish Lira



### Russian Ruble



### Chinese Yuan

ch Russ exch China exch  
range rate

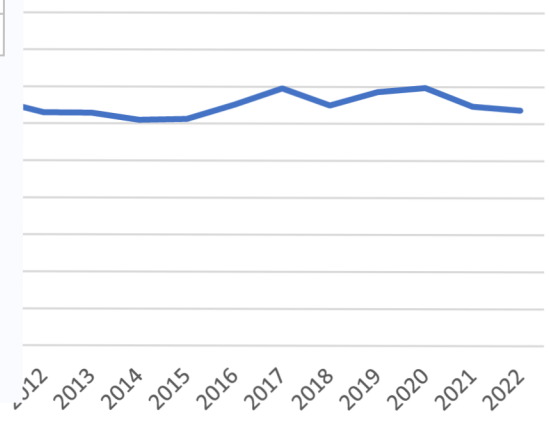
coefficients, N = 16

KZ exchange rate

0.83666

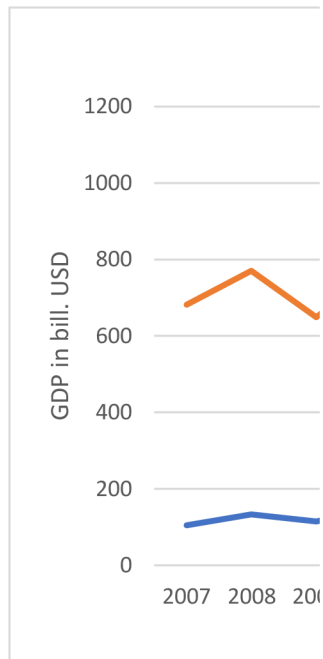
0.95517

-0.18634



Year

| year | Kazakhstan<br>GDP in bil.<br>USD | Turkey<br>GDP in bil.<br>USD | Russia<br>GDP in bil.<br>USD | China<br>GDP in bil.<br>USD |
|------|----------------------------------|------------------------------|------------------------------|-----------------------------|
| 2007 | 104.85                           | 681.32                       | 1299.7                       | 3550.33                     |
| 2008 | 133.44                           | 770.45                       | 1660.85                      | 4594.34                     |
| 2009 | 115.31                           | 649.29                       | 1222.65                      | 5101.69                     |
| 2010 | 148.05                           | 776.97                       | 1524.92                      | 6087.19                     |
| 2011 | 192.63                           | 838.79                       | 2045.92                      | 7551.55                     |
| 2012 | 208                              | 880.56                       | 2208.29                      | 8532.19                     |
| 2013 | 236.63                           | 957.8                        | 2292.47                      | 9570.47                     |
| 2014 | 221.42                           | 938.93                       | 2059.24                      | 10475.62                    |
| 2015 | 184.39                           | 864.31                       | 1363.48                      | 11061.57                    |
| 2016 | 137.28                           | 869.68                       | 1276.79                      | 11233.31                    |
| 2017 | 166.81                           | 858.99                       | 1574.2                       | 12310.49                    |
| 2018 | 179.34                           | 778.48                       | 1657.33                      | 13894.91                    |
| 2019 | 181.67                           | 759.93                       | 1693.11                      | 14279.97                    |
| 2020 | 171.08                           | 720.29                       | 1493.08                      | 14687.74                    |
| 2021 | 197.11                           | 819.03                       | 1836.89                      | 17820.46                    |
| 2022 | 220.62                           | 905.99                       | 2240.42                      | 17963.17                    |

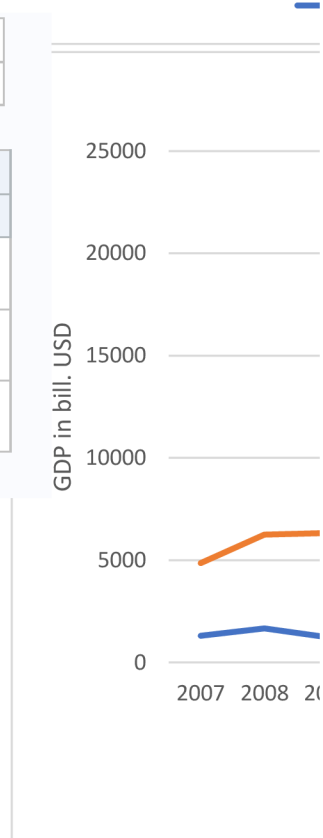


in bil USD

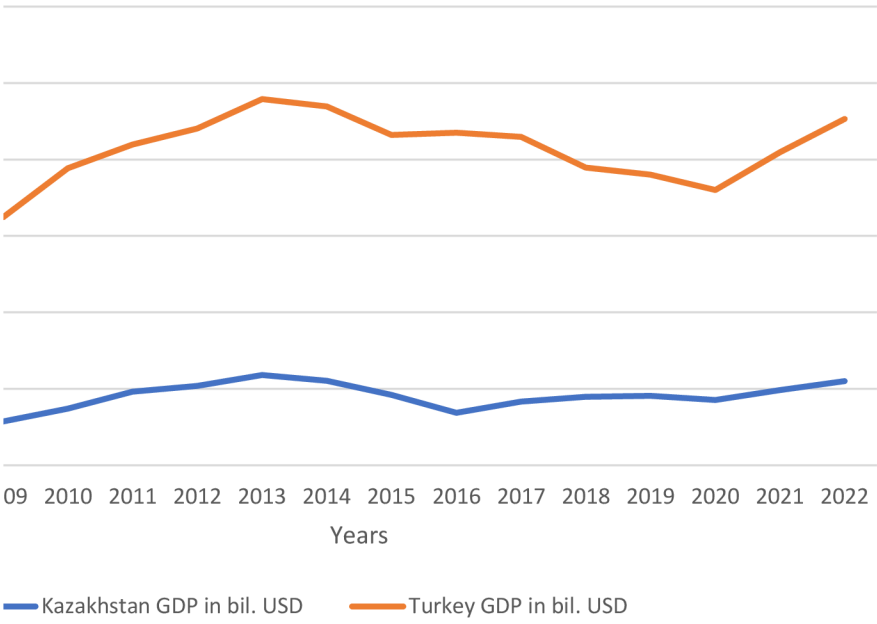
|                          |                     |
|--------------------------|---------------------|
| <b>3 With Variables:</b> | Turkey Russia China |
| <b>1 Variables:</b>      | Kazakhstan          |

| Pearson Correlation Coefficients, N = 16 |  | Kazakhstan |
|--|--|------------|
| Turkey<br>Turkey                         |  | 0.80233    |
| Russia<br>Russia                         |  | 0.86689    |
| China<br>China                           |  | 0.57045    |

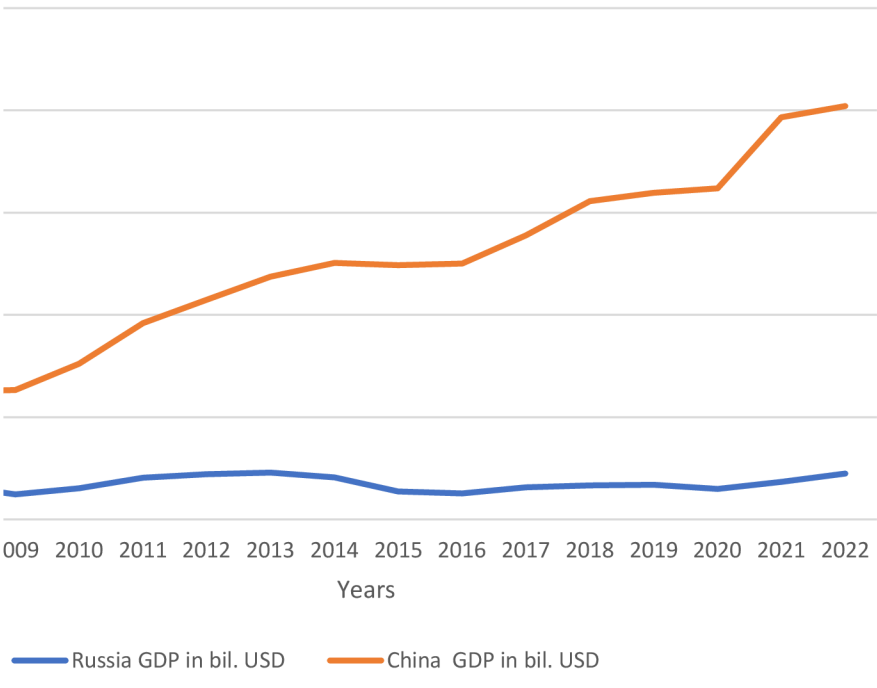
|            | Kazakhstan | Turkey  | Russia  | China   |
|------------|------------|---------|---------|---------|
| Kazakhstan | 1          | 0.80233 | 0.86689 | 0.57045 |
| Turkey     | 0.80233    | 1       | 0.70421 | 0.34223 |
| Russia     | 0.86689    | 0.70421 | 1       | 0.29112 |
| China      | 0.57045    | 0.34223 | 0.29112 | 1       |



### GDP of Kazakhstan and Turkey



### GDP of Russia and China



Fixed base index

GDP

|                     | 2007 | 2022   |
|---------------------|------|--------|
| Kazakh Tenge to USD | 127  | 461.71 |

CH exch

|                                  |          |
|----------------------------------|----------|
| Fixed base index of Chinese Yuan | 0.815903 |
|----------------------------------|----------|

chain base index

KZ and Turkey GDP, TUR 20

|                  | 2015     | 2016        |
|------------------|----------|-------------|
| Chain base index | 1.242604 | 1.538773122 |

trk exch

|                  |          |
|------------------|----------|
| Chain base index | 1.847997 |
|------------------|----------|

| Year             | 2015     | 2016        |
|------------------|----------|-------------|
| Chain base index | 1.721979 | 1.296817432 |

average growth rate index

GDP div  
mult by 1/16

Average growth rate index

|            |        |        |       |
|------------|--------|--------|-------|
| Kazakhstan | Turkey | Russia | China |
| 2.104      | 1.330  | 1.724  | 5.060 |

|                  |
|------------------|
| Fixed base index |
| 3.635511811      |

09, KZ 2009

|                  |            |          |          |          |
|------------------|------------|----------|----------|----------|
|                  | Kazakhstan | Turkey   | Russia   | China    |
| Relative minimum | 0.864134   | 0.842741 |          |          |
| Latest period    | 1.119274   | 1.106174 | 1.219681 | 1.008008 |

2.104148784 1.3298 1.723797799 5.059578  
0.131509299 0.0831 0.107737362 0.316224

|                           |            |         |          |          |
|---------------------------|------------|---------|----------|----------|
| GDP                       | Kazakhstan | Turkey  | Russia   | China    |
| Average growth rate index | 0.131509   | 0.08311 | 0.107737 | 0.316224 |

|             |
|-------------|
| 0.227219488 |
|-------------|



| year | KZ exchange | Turk exch | Russ exch | China exch | T val |           |
|------|-------------|-----------|-----------|------------|-------|-----------|
| 2007 | 127         | 1.41875   | 26.3311   | 7.8073     | 1     |           |
| 2008 | 120.3       | 1.16864   | 24.5462   | 7.2996     | 2     |           |
| 2009 | 120.79      | 1.60892   | 29.3916   | 6.8367     | 3     |           |
| 2010 | 148.46      | 1.45542   | 30.1851   | 6.8281     | 4     |           |
| 2011 | 146.73      | 1.56578   | 30.3505   | 6.6215     | 5     |           |
| 2012 | 149.13      | 1.881275  | 32.1961   | 6.3001     | 6     |           |
| 2013 | 152.2       | 1.7762    | 30.3727   | 6.2897     | 7     |           |
| 2014 | 178.81      | 2.17448   | 32.6587   | 6.099      | 8     |           |
| 2015 | 222.19      | 2.314539  | 56.2376   | 6.1248     | 9     |           |
| 2016 | 341.9       | 2.99268   | 72.9299   | 6.5126     | 10    |           |
| 2017 | 326.17      | 3.59825   | 60.6569   | 6.9552     | 11    |           |
| 2018 | 345.09      | 3.75345   | 57.6002   | 6.4959     | 12    |           |
| 2019 | 383.04      | 5.39474   | 69.4706   | 6.8557     | 13    | confide   |
| 2020 | 414.08      | 5.924539  | 61.9057   | 6.97       | 14    | std error |
| 2021 | 426.7       | 7.365     | 73.8757   | 6.4682     | 15    |           |
| 2022 | 461.71      | 13.6105   | 74.2926   | 6.37       | 16    | lower     |
| 2023 | 418.7       |           |           |            | 17    | 399.71    |
| 2024 | 444.035     |           |           |            | 18    | 425.045   |

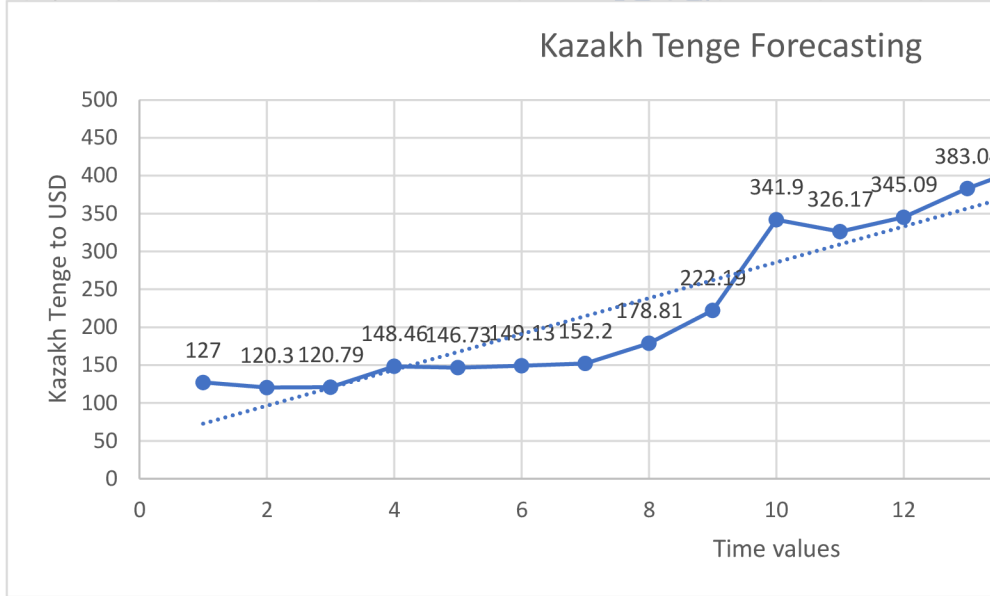
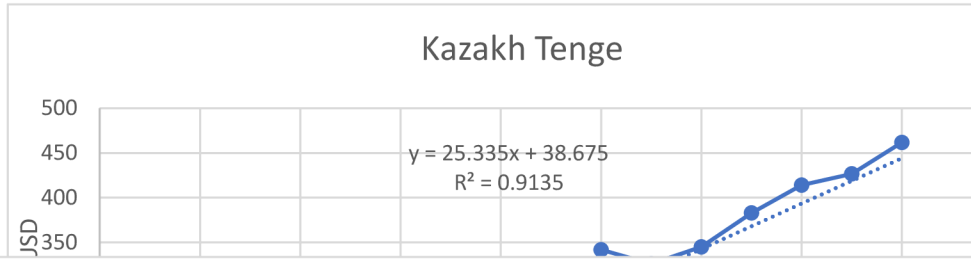
testing

| year | KZ exchange | Turk exch | Russ exch | China exch | T val |
|------|-------------|-----------|-----------|------------|-------|
| 2007 | 127         | 1.41875   | 26.3311   | 7.8073     | 1     |
| 2008 | 120.3       | 1.16864   | 24.5462   | 7.2996     | 2     |
| 2009 | 120.79      | 1.60892   | 29.3916   | 6.8367     | 3     |
| 2010 | 148.46      | 1.45542   | 30.1851   | 6.8281     | 4     |
| 2011 | 146.73      | 1.56578   | 30.3505   | 6.6215     | 5     |
| 2012 | 149.13      | 1.881275  | 32.1961   | 6.3001     | 6     |
| 2013 | 152.2       | 1.7762    | 30.3727   | 6.2897     | 7     |
| 2014 | 178.81      | 2.17448   | 32.6587   | 6.099      | 8     |
| 2015 | 222.19      | 2.314539  | 56.2376   | 6.1248     | 9     |
| 2016 | 341.9       | 2.99268   | 72.9299   | 6.5126     | 10    |
| 2017 | 326.17      | 3.59825   | 60.6569   | 6.9552     | 11    |
| 2018 | 345.09      | 3.75345   | 57.6002   | 6.4959     | 12    |
| 2019 | 383.04      | 5.39474   | 69.4706   | 6.8557     | 13    |
| 2020 | 414.08      | 5.924539  | 61.9057   | 6.97       | 14    |
| 2021 | 418.7       |           |           |            | 15    |
| 2022 | 444.035     |           |           |            | 16    |

REF

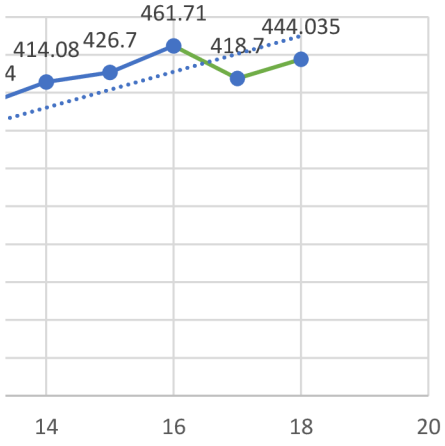
| Year | REF    |
|------|--------|
| 2021 | -1.87% |
| 2022 | -3.83% |

| Year | Estimated predictions |
|------|-----------------------|
| 2023 | 469.37                |
| 2024 | 494.705               |



18.99  
upper  
437.69  
463.025

5.335  
8.675



|   |    |
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| Correlation table of Exch rates.....1p                        | 3  |
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| Time series for al countries ....3p                           | 1  |
| Forecasting for all countries with confidence interval.....4p | 2  |
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| Stat verification.....1p                                      | 1  |
| Econ verification.....0.5p                                    | 1  |
| KZ Export with all variable big model data prep               | 1  |
| data prep   | 1  |
| 1st corr  | 1  |
| model data modification                                       | 1  |
| 2nd corr  | 1  |
| Export of KZ econometrics model                               | 2  |
| econ verifiation with foreignn trade                          | 1  |
| stat verification and hetero                                  | 2  |
| discussions for each country in comparson to KZ and researc   | 4  |
| concl   | 2  |

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10

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