

| 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. USD | Constant | KZT exchange rate | KZ inflation % | GDP of main trading partner China bill. USD | Chinese Yuan exchange rate | GDP of Turkey bill. 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)-1 | 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 x8 | TUR exch x9 | TUR infatior x10 | GDP of RU x11 | RU exch x12 | RU infatior x13 | KZ raw material export bil USD 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 |

L/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 y | constant x1 | exch r kzt x2 | GDP of kz x3 | GDP of main tr x4 1st diff | trading p. Chi 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. (|
| Sum squared resid | 879.9625 | S.E. (|
| R-squared | 0.604274 | Adjust |
| F(3, 11) | 5.599009 | P-valu |
| Log-likelihood | -51.82280 | Akaik |
| Schwarz criterion | 114.4778 | Hanna |
| rho | 0.017279 | Durbin |

Excluding the constant, p-value was h:

— □ ×



-2022 (T = 15)

t-ratio p-value

0.3106 0.7619

-3.125 0.0097 ***

2.903 0.0144 **

3 0.5715 0.5792

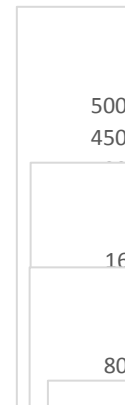
| | |
|---------------|----------|
| dependent var | 12.60291 |
| of regression | 8.944081 |
| ted R-squared | 0.496349 |
| ue (F) | 0.014040 |
| e criterion | 111.6456 |
| n-Quinn | 111.6154 |
| n-Watson | 1.701760 |

ighest for variable 5 (x4_Diff)

| | KZ Export bil USD | constant | exchange rate of KZT/USD | GDP of KZ | GDP of main export destinatio n China in 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 |



| | |
|--------------------------|----------|
| 3 With Variables: | Turk exc |
| 1 Variables: | KZ exch |

| 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-spx>
- https://www.cbr.ru/eng/currency_base/daily/?UniDbQuery.Posted=Tru
- <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

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



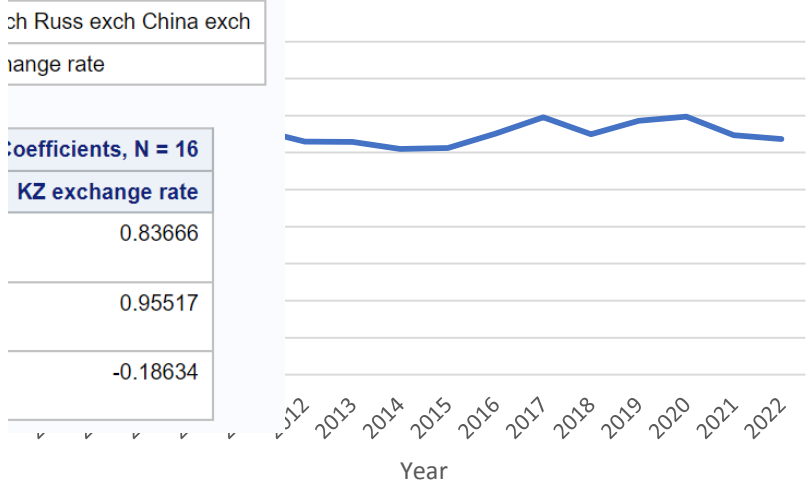
Turkish Lira



Russian Ruble



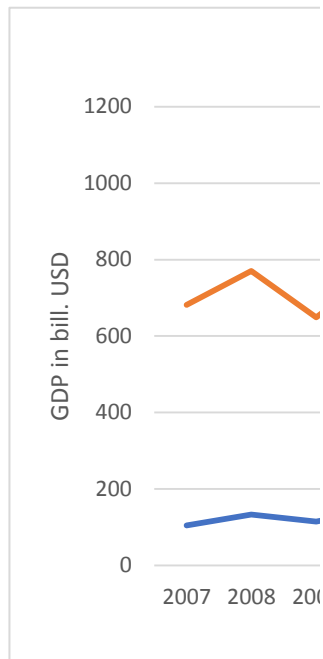
Chinese Yuan



| Coefficients, N = 16 |
|----------------------|
| KZ exchange rate |
| 0.83666 |
| 0.95517 |
| -0.18634 |

Year

| year | Kazakhstan GDP in bil. USD | Turkey GDP in bil. USD | Russia GDP in bil. USD | China GDP in bil. 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 |

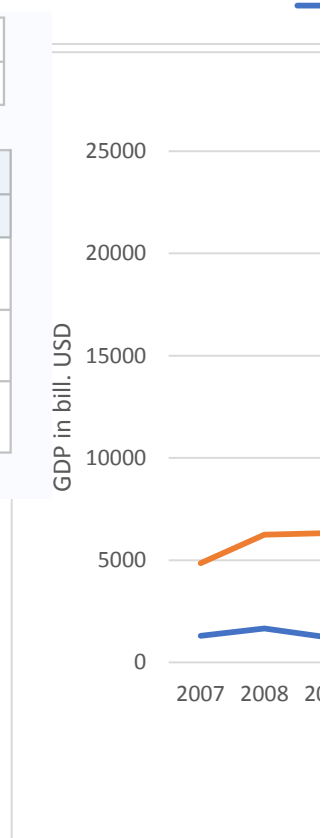


in bil USD

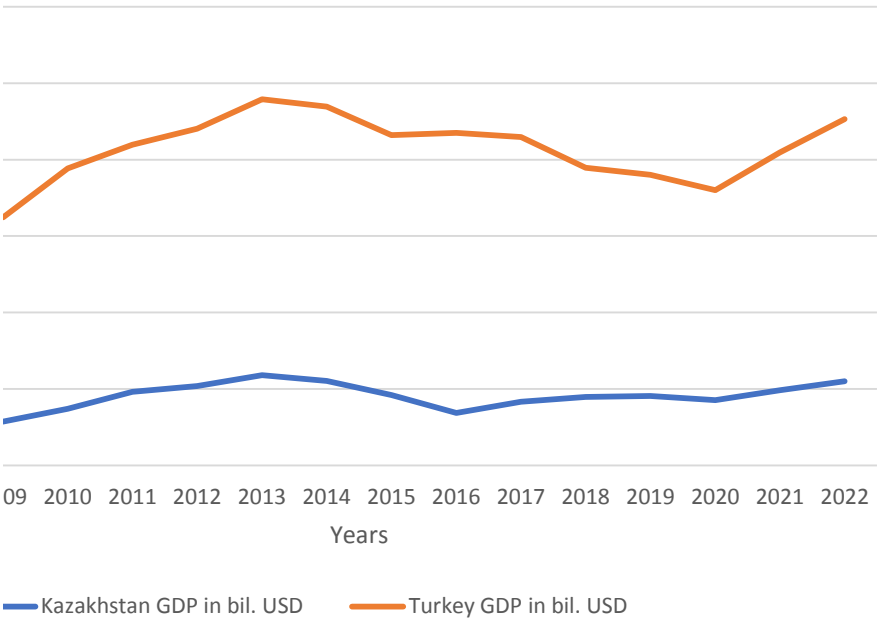
| | |
|--------------------------|---------------------|
| 3 With Variables: | Turkey Russia China |
| 1 Variables: | Kazakhstan |

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

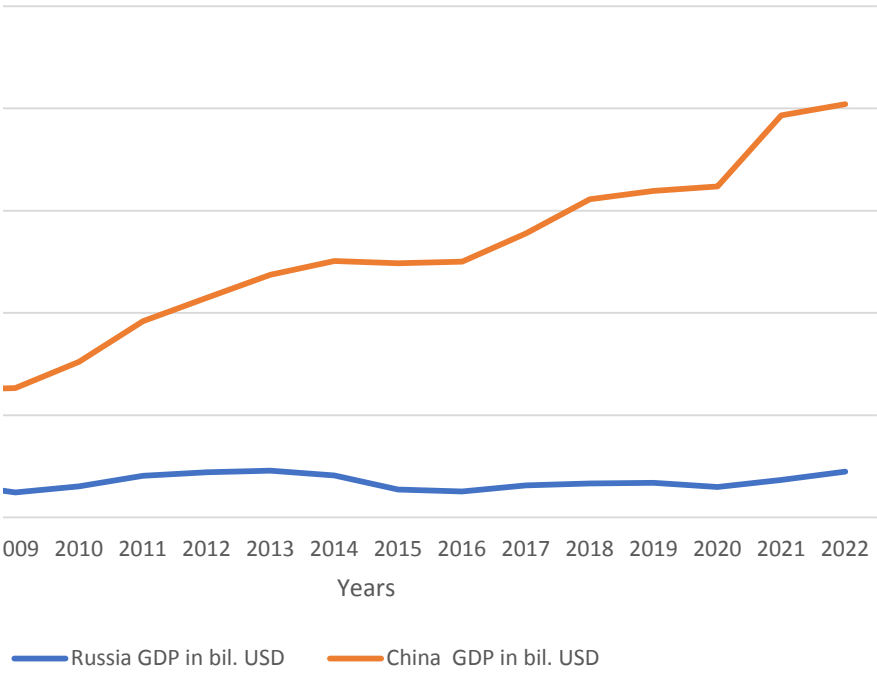
| | Kazakhstan | Turkey | Russia | China |
|------------|------------|---------|---------|---------|
| Kazakhstan | 1 | 0.80233 | 0.86689 | 0.57045 |
| Turkey | 0.80233 | 1 | 0.70421 | 0.34223 |
| Russia | 0.86689 | 0.70421 | 1 | 0.29112 |
| China | 0.57045 | 0.34223 | 0.29112 | 1 |



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 r | 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 |

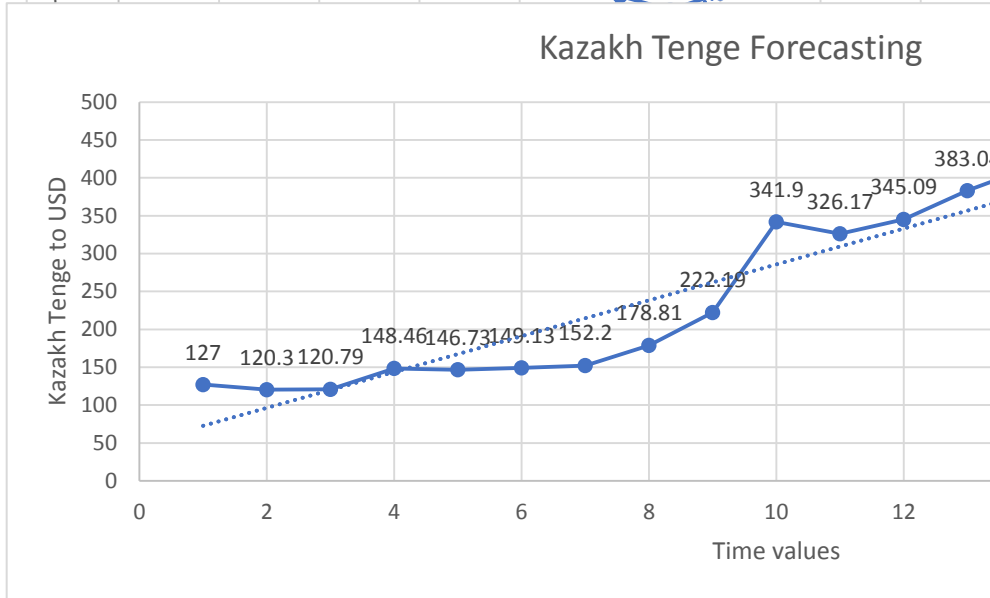
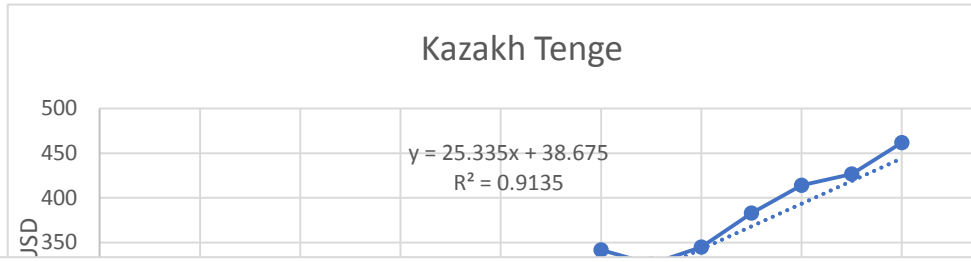
testing

| year | KZ exchange r | 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

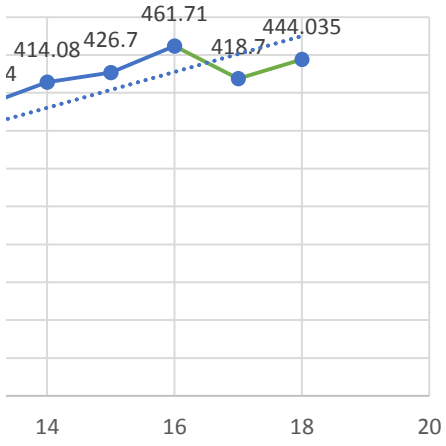
| Year | REF |
|------|--------|
| 2021 | -1.87% |
| 2022 | -3.83% |

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



18.99
upper
437.69
463.025

5.335
8.675



| | |
|---|----|
| Intro | 1 |
| Objective and Metho | 9 |
| Research | 18 |
| add research | 0 |
| Correlation table of GDPs2p | 4 |
| Correlation table of Exch rates.....1p | 3 |
| Foreign trade explanations.....3p | 2 |
| Time series for al countries3p | 1 |
| Forecasting for all countries with confidence interval.....4p | 2 |
| KZ NX with exp.....3p | 1 |
| 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 |

intro, obj and meth
10

Pages from prac estim: 31
pages fin prac 31

theoretical 18
theo estim 18

Data corr and prep and pred page amount
12

Pages finished
59

Econometrics equations for all plus expl
13

Discussion
6

Full thesis size
59

Percentage complete
100.00%

word count
20000

goal
19000

word compl

| |
|---------|
| 105.26% |
|---------|

full thesis with format page count

| |
|----|
| 74 |
|----|