

VÝSLEDEK y-nominal price
 x- inflation price

Regresní statistika

Násobné R	0.989245
Hodnota s _y	0.978605
Nastavená	0.977674
Chyba stř.	4.23269
Pozorován	25

ANOVA

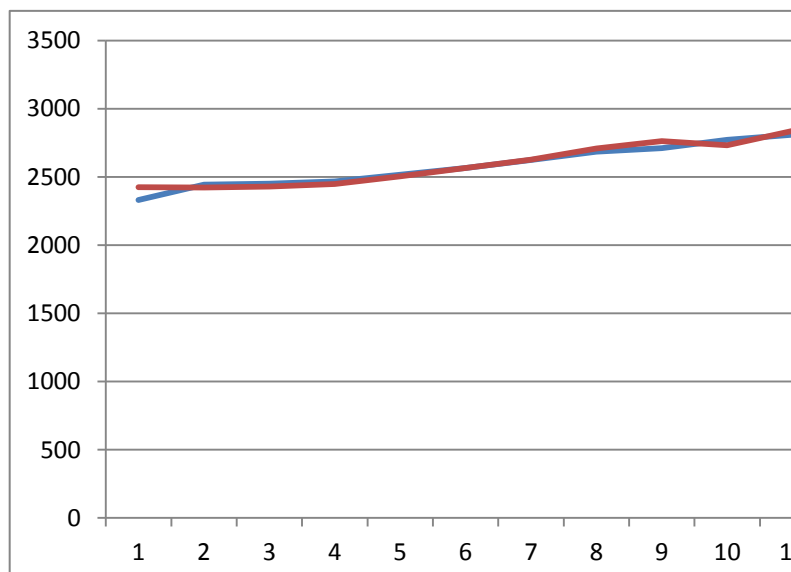
	<i>Rozdíl</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>ýznamnost F</i>
Regrese	1	18847.31	18847.31	1052.002	1.05E-20
Rezidua	23	412.0603	17.91567		
Celkem	24	19259.37			

	<i>Koeficienty</i>	<i>chyba</i>	<i>stř. hodr</i>	<i>t Stat</i>	<i>Hodnota P</i>	<i>Dolní 95%</i>	<i>Horní 95%</i>	<i>Dolní 99,0%</i>	<i>Horní 99,0%</i>
Hranice	-10.3881	1.857316	-5.59308	1.08E-05	-14.2303	-6.54597	-15.6022	-5.17401	
	41.79	1.062525	0.032759	32.43457	1.05E-20	0.994758	1.130292	0.97056	1.154491

Factors influencing the price

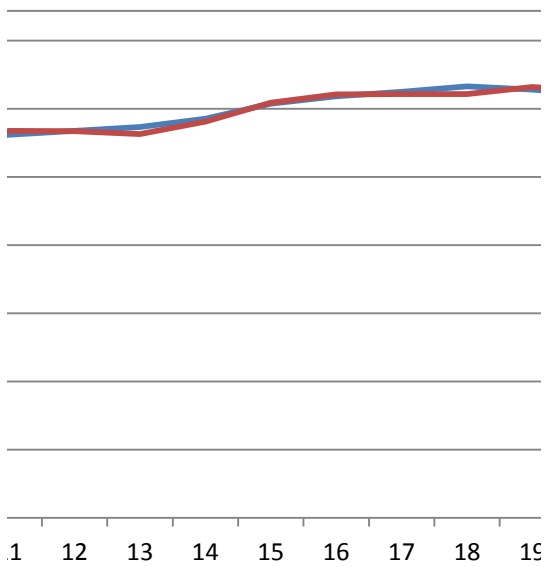
Inflation CPI euro usd 2 cols

year	Nominal Price \$	Inflation Adjusted Price \$
1990	23.19	41.79
1991	20.2	35.02
1992	19.25	32.39
1993	16.75	27.39
1994	15.66	24.94
1995	16.75	25.96
1996	20.46	30.78
1997	18.64	27.43
1998	11.90	17.26
1999	16.56	23.42
2000	27.39	37.54
2001	23	30.68
2002	22.81	29.92
2003	27.69	35.55
2004	37.66	47.04
2005	50.04	60.44
2006	58.3	68.27
2007	64.2	72.98
2008	91.48	100
2009	53.48	58.75
2010	71.21	77.1
2011	87.04	91.37
2012	86.46	88.93
2013	91.17	92.4
2014	85.6	85.34
2015	47.1	40.72

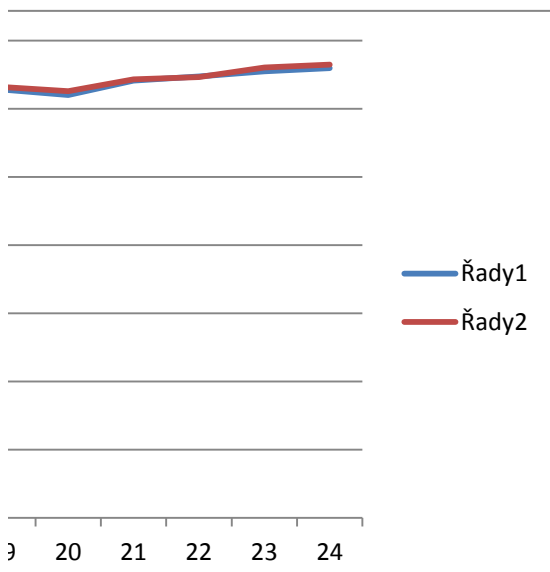


exchange rate usd/euro Average Rate

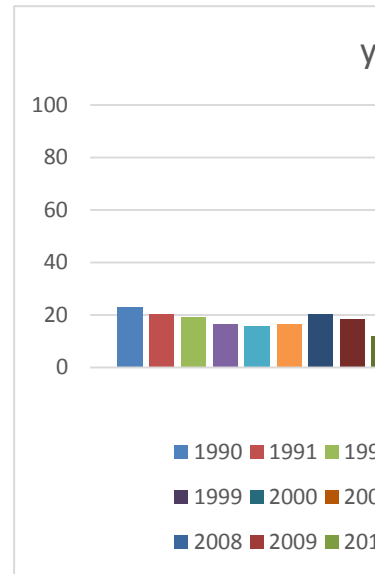
- 0.788742
- 0.811868
- 0.769998
- 0.844983
- 0.833602
- 0.751091
- 0.775139
- 0.885013
- 0.898283
- 0.939475
- 1.085899
- 1.117587
- 1.060945
- 0.885766
- 0.804828
- 0.805097
- 0.797153
- 0.730754
- 0.683499
- 0.718968
- 0.755883
- 0.719219
- 0.778848
- 0.753234
- 0.753941
- 0.900053



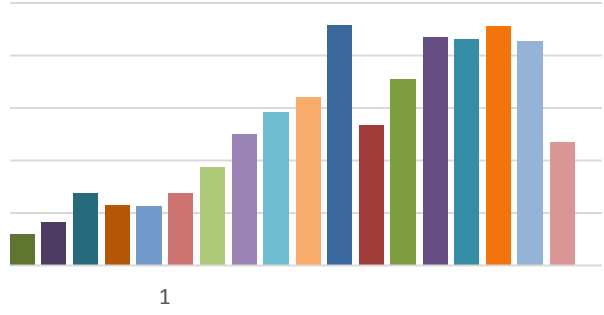
world demand/consumption(million barrels per year)	rate of change
2331.44188	4.622546396
2444.43712	0.2463497
2450.473855	0.667682238
2466.94521	1.94343037
2515.838785	1.891804567
2564.3513	2.256880752
2623.561965	2.327876591
2686.090845	0.909021993
2710.731995	2.238905679
2772.812655	1.288515588
2809.00715	1.025445478
2838.110425	0.980952226
2866.22674	2.054398036
2926.345525	3.610530221
3035.95977	1.761065923
3090.38346	1.073009389
3123.903235	1.284543073
3164.553285	-0.78140965
3140.01689	-1.264811657
3100.79764	3.285256793
3206.12715	0.923326457
3236.00605	1.127715281
3272.915215	0.758525303
3297.930855	90.22351547
33733.3	1.450202602
34229.7	



world supply(million barrels per year)	balance
2424.914	93.47212
2421.3735	-23.06362
2429.1845	-21.289355
2449.1865	-17.75871
2505.2505	-10.588285
2566.1325	1.7812
2627.489	3.927035
2709.03	22.939155
2762.3565	51.624505
2731.587	-41.225655
2836.9625	27.95535
2835.028	-3.082425
2814.1865	-52.04024
2905.619	-20.726525
3044.173	8.21323
3106.1135	15.73004
3107.4275	-16.475735
3107.245	-57.308285
3157.7975	17.78061
3128.1595	27.36186
3215.6135	9.48635
3231.418	-4.58805
3302.009	29.093785
3322.011	24.080145
3401.8365	-30331.464
34901.3	671.6



real/nominal price



92 1993 1994 1995 1996 1997 1998
01 2002 2003 2004 2005 2006 2007
10 2011 2012 2013 2014 2015

Nominal Price \$	exchange rate	world demand	world supply(million barrels per year)
23.19	0.788742	2331.44188	2424.914
20.2	0.811868	2444.43712	2421.3735
19.25	0.769998	2450.47386	2429.1845
16.75	0.844983	2466.94521	2449.1865
15.66	0.833602	2515.83879	2505.2505
16.75	0.751091	2564.3513	2566.1325
20.46	0.775139	2623.56197	2627.489
18.64	0.885013	2686.09085	2709.03
11.90	0.898283	2710.732	2762.3565
16.56	0.939475	2772.81266	2731.587
27.39	1.085899	2809.00715	2836.9625
23	1.117587	2838.11043	2835.028
22.81	1.060945	2866.22674	2814.1865
27.69	0.885766	2926.34553	2905.619
37.66	0.804828	3035.95977	3044.173
50.04	0.805097	3090.38346	3106.1135
58.3	0.797153	3123.90324	3107.4275
64.2	0.730754	3164.55329	3107.245
91.48	0.683499	3140.01689	3157.7975
53.48	0.718968	3100.79764	3128.1595
71.21	0.755883	3206.12715	3215.6135
87.04	0.719219	3236.00605	3231.418
86.46	0.778848	3272.91522	3302.009
91.17	0.753234	3297.93086	3322.011
85.6	0.753941	33733.3	3401.8365
47.1	0.900053	34229.7	34901.3

$$Y=147,457944-131,64903*X1+0,00088*X2$$

X1 exchange rate

30,5% of Nominal price variability can be explained with

X2 world demand

MODEL WITHOUT "WORLD SUPPLY"					
Summary Output					
<i>Regresní statistika</i>					
Multiple R	0.60076354				
R Square	0.36091683				
Adjusted R Square	0.30534438				
Standard Error	23.3640139				
Observations	26				
ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regressions	2	7090.42891	3545.21446	6.49452809	0.00580644
Rezidual	23	12555.1744	545.877146		
Total	25	19645.6033			
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>
Intercept	147.457944	34.7719316	4.24071765	0.00030903	75.526723
exchange rate usd/eur	-131.64903	41.172485	-3.1975003	0.00400251	-216.82081
world demand/constant	0.00088019	0.00055234	1.59358197	0.1246809	-0.0002624
Possibility					
	<i>Percentil</i>	<i>Nominal Price \$</i>			
	1.923076923	11.9			
	5.769230769	15.66			
	9.615384615	16.56			
	13.46153846	16.75			
	17.30769231	16.75			
	21.15384615	18.64			
	25	19.25			

28.84615385	20.2
32.69230769	20.46
36.53846154	22.81
40.38461538	23
44.23076923	23.19
48.07692308	27.39
51.92307692	27.69
55.76923077	37.66
59.61538462	47.1
63.46153846	50.04
67.30769231	53.48
71.15384615	58.3
75	64.2
78.84615385	71.21
82.69230769	85.6
86.53846154	86.46
90.38461538	87.04
94.23076923	91.17
98.07692308	91.48

Summary Output

Regression Statistics

Multiple R
R Square
Adjusted R Square
Standard Error
Observations

ANOVA

Regressions
Rezidual
Total

Intercept
exchange rate usd/euro Average Rate
world demand/consumption(million barrels per year)
world supply(million barrels per year)

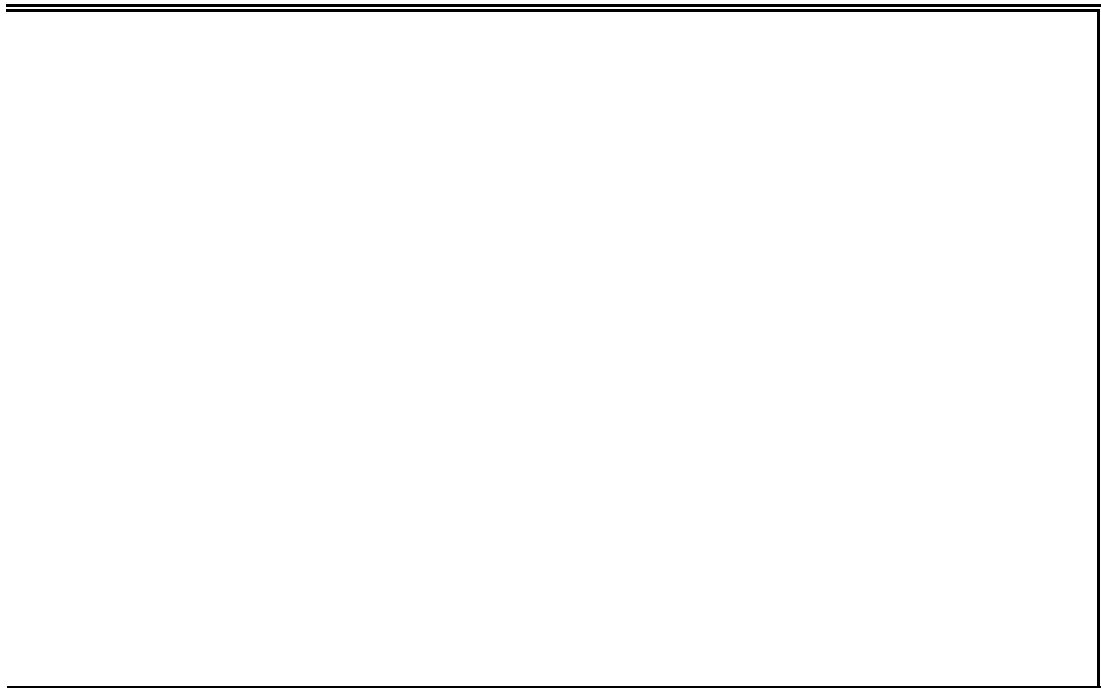
Possibility

Percentil

1.923076923
5.769230769
9.615384615
13.46153846
17.30769231
21.15384615
25
28.84615385
32.69230769
36.53846154
40.38461538
44.23076923
48.07692308
51.92307692
55.76923077
59.61538462
63.46153846
67.30769231
71.15384615
75

	78.84615385
	82.69230769
	86.53846154
	90.38461538
	94.23076923
	98.07692308

h changings in exchange rate and world demand.



<i>Upper 95%</i>	<i>Lower 95,0%</i>	<i>Upper 95,0%</i>
219.389165	75.526723	219.3891648
-46.477259	-216.82081	-46.47725917
0.00202279	-0.0002624	0.002022785



MODEL WITH "WORLD SUPPLY"

0.605951856
0.367177652
0.280883696
23.77180988
26

<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
3	7213.426481	2404.47549	4.25496369	0.01631279
22	12432.17678	565.098945		
25	19645.60327			

<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
145.2680873	35.6888597	4.07040428	0.00050799	71.2539223	219.282252
-128.2048852	42.53662572	-3.0139881	0.00638414	-216.42045	-39.989323
0.001150369	0.000806961	1.42555629	0.16803147	-0.0005232	0.0028239
-0.000509564	0.001092226	-0.4665369	0.64541807	-0.0027747	0.00175558

Nominal Price \$

11.9
15.66
16.56
16.75
16.75
18.64
19.25
20.2
20.46
22.81
23
23.19
27.39
27.69
37.66
47.1
50.04
53.48
58.3
64.2

71.21
85.6
86.46
87.04
91.17
91.48

H0 more complicated model(with world supply) is worse
H1 more complicated model(with world supply) is better

Testing with: $F = \frac{(SR1 - SR2) / (p2 - p1)}{SR2 / (n - p2)}$

SR1=12555,1744

SR2=12432,1768

p1=2 n=26

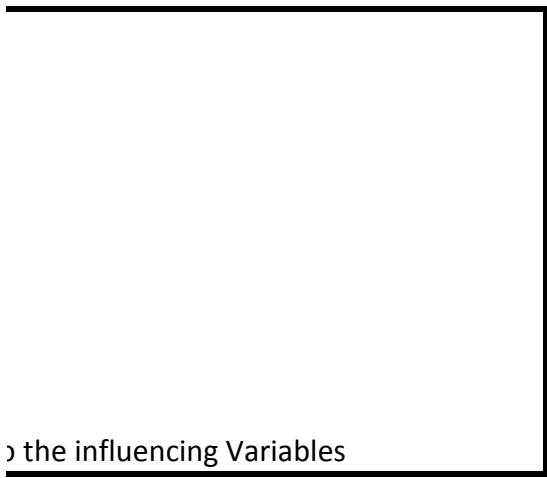
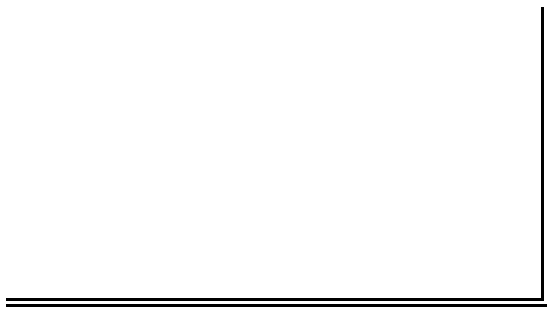
p2=3

F=0,22755

$F_{0,95}(1;23)=4,279$

$F < F_{0,95}(1;23) \Rightarrow$ the model cant be improved by adding 'world supply'tc

<i>Lower 95,0%</i>	<i>Upper 95,0%</i>
71.2539223	219.282252
-216.42045	-39.989323
-0.0005232	0.0028239
-0.0027747	0.00175558



o the influencing Variables

Nominal Price \$	balance	exchange rate usd/euro	Average Rate
23.19	93.47212	0.788742	
20.2	-23.06362	0.811868	
19.25	-21.289355	0.769998	
16.75	-17.75871	0.844983	
15.66	-10.588285	0.833602	
16.75	1.7812	0.751091	
20.46	3.927035	0.775139	
18.64	22.939155	0.885013	
11.90	51.624505	0.898283	
16.56	-41.225655	0.939475	
27.39	27.95535	1.085899	
23	-3.082425	1.117587	
22.81	-52.04024	1.060945	
27.69	-20.726525	0.885766	
37.66	8.21323	0.804828	
50.04	15.73004	0.805097	
58.3	-16.475735	0.797153	
64.2	-57.308285	0.730754	
91.48	17.78061	0.683499	
53.48	27.36186	0.718968	
71.21	9.48635	0.755883	
87.04	-4.58805	0.719219	
86.46	29.093785	0.778848	
91.17	24.080145	0.753234	
85.6	-30331.464	0.753941	
47.1	671.6	0.900053	

Summary Output

<i>Regression Statistics</i>	
Multiple R	0.58888137
R Square	0.34678126
Adjusted R Square	0.28997963
Standard Error	23.6209893
Observations	26

$Y = 144,90678 - 0,0011297 * X1 - 124,57442 * X2$	
Y - price	
X1 - balance	28,99% of Nominal price va
X2 - exchange rate	

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regressions	2	6812.72713	3406.36356	6.10512882	0.00746748
Rezidual	23	12832.8761	557.951137		
Total	25	19645.6033			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	144.90678	35.4598683	4.08650081	0.00045372	71.5524539	218.261107
balance	-0.0011297	0.00080147	-1.4095503	0.17205144	-0.0027877	0.00052826
exchange rate u	-124.57442	42.0490839	-2.9625952	0.00697573	-211.55957	-37.589259

riability can be explained with changings in exchange rate and balance

<i>Lower 95,0%</i>	<i>Upper 95,0%</i>
71.5524539	218.261107
-0.0027877	0.00052826
-211.55957	-37.589259

Nominal Price \$	exchange rate usd/euro	Average Rate
23.19		0.788742
20.2		0.811868
19.25		0.769998
16.75		0.844983
15.66		0.833602
16.75		0.751091
20.46		0.775139
18.64		0.885013
11.90		0.898283
16.56		0.939475
27.39		1.085899
23		1.117587
22.81		1.060945
27.69		0.885766
37.66		0.804828
50.04		0.805097
58.3		0.797153
64.2		0.730754
91.48		0.683499
53.48		0.718968
71.21		0.755883
87.04		0.719219
86.46		0.778848
91.17		0.753234
85.6		0.753941
47.1		0.900053

<i>Nominal Price \$</i>	
Nominal Price \$	1
exchange rate usd/euro A	-0.538844707

<i>Nominal Price \$</i>	
Nominal Price \$	1
world demand/consumpt	0.277182689

<i>Nominal Price \$</i>	
Nominal Price \$	1
world supply(million barre	0.077271425

<i>Nominal Price \$</i>	
Nominal Price \$	1
balance	-0.312262948

world demand/consumption(million barrels per year)	world supply(million barrels per year)
2331.44188	2424.914
2444.43712	2421.3735
2450.473855	2429.1845
2466.94521	2449.1865
2515.838785	2505.2505
2564.3513	2566.1325
2623.561965	2627.489
2686.090845	2709.03
2710.731995	2762.3565
2772.812655	2731.587
2809.00715	2836.9625
2838.110425	2835.028
2866.22674	2814.1865
2926.345525	2905.619
3035.95977	3044.173
3090.38346	3106.1135
3123.903235	3107.4275
3164.553285	3107.245
3140.01689	3157.7975
3100.79764	3128.1595
3206.12715	3215.6135
3236.00605	3231.418
3272.915215	3302.009
3297.930855	3322.011
33733.3	3401.8365
34229.7	34901.3

exchange rate usd/euro Average Rate

1

world demand/consumption(million barrels per year)

1

world supply(million barrels per year)

1

balance

1

balance

93.47212
-23.0636
-21.2894
-17.7587
-10.5883
1.7812
3.927035
22.93916
51.6245
-41.2257
27.95535
-3.08243
-52.0402
-20.7265
8.21323
15.73004
-16.4757
-57.3083
17.78061
27.36186
9.48635
-4.58805
29.09379
24.08014
-30331.5
671.6

inverse dependence for -1

independence for 0

direct dependence for 1

the closer the number is to 1 or -1 the stronger is dependence

Nominal Price		Inflation Adjusted Price \$		
min	11.9	1998 min	17.26	1998
max	91.48	2008 max	100	2008
median	27.54	median	39.13	

world demand/consumption(million barrels per year)

min	2331.44188	1990
max	34229.7	2015
median	2896.28613	

world supply(million barrels per year)

min	2421.3735	1991
max	34901.3	2015
median	2871.29075	

Summary Output

<i>Regression Statistics</i>	
Multiple R	0.491912
R Square	0.241977
Adjusted R Square	0.210393
Standard Error	7519.357
Observations	26

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regressions	1	4.33E+08	4.33E+08	7.661312	0.010696
Residual	24	1.36E+09	56540737		
Total	25	1.79E+09			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>
Intercept	-2091.83	3036.526	-0.68889	0.497499	-8358.91
t	544.2324	196.6223	2.767907	0.010696	138.4239

$$Y(\text{demand}) = 544,2324 * t - 2091,83$$

F

<u>Upper 95% lower 95,0%pper 95,0%</u>		
4175.251	-8358.91	4175.251
950.0409	138.4239	950.0409

Summary Output

<i>Regression Statistics</i>	
Multiple R	0.378834
R Square	0.143515
Adjusted R	0.107828
Standard E	5937.78
Observatio	26

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>ignificance F</i>
Regression	1	1.42E+08	1.42E+08	4.021514	0.056325
Rezidual	24	8.46E+08	35257225		
Total	25	9.88E+08			

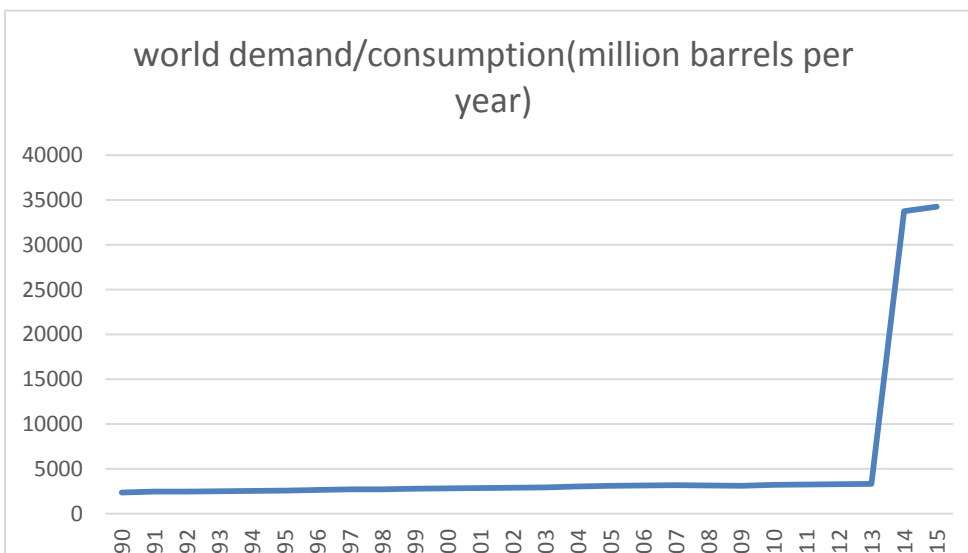
	<i>Coefficients</i>	<i>andard Err</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>ower 95,0%</i>	<i>pper 95,0%</i>
Intercept	-86.3845	2397.841	-0.03603	0.97156	-5035.28	4862.515	-5035.28	4862.515
t	311.3658	155.2659	2.005371	0.056325	-9.08729	631.8189	-9.08729	631.8189

$T(\text{supply}) = 311,3658 * t - 86,3845$

year	t	world demand/consumption(million barrels per year)	Nominal Price \$
1990	1	2331.44188	23.19
1991	2	2444.43712	20.2
1992	3	2450.473855	19.25
1993	4	2466.94521	16.75
1994	5	2515.838785	15.66
1995	6	2564.3513	16.75
1996	7	2623.561965	20.46
1997	8	2686.090845	18.64
1998	9	2710.731995	11.90
1999	10	2772.812655	16.56
2000	11	2809.00715	27.39
2001	12	2838.110425	23
2002	13	2866.22674	22.81
2003	14	2926.345525	27.69
2004	15	3035.95977	37.66
2005	16	3090.38346	50.04
2006	17	3123.903235	58.3
2007	18	3164.553285	64.2
2008	19	3140.01689	91.48
2009	20	3100.79764	53.48
2010	21	3206.12715	71.21
2011	22	3236.00605	87.04
2012	23	3272.915215	86.46
2013	24	3297.930855	91.17
2014	25	33733.3	85.6
2015	26	34229.7	47.1

As we can see the world demand and world supply (exception are years 1900-91 but we can ignore that because it was accidental) functions are constantly growing during the time so we can use linear trend

$$T(\text{demand}) = 544,2324 * t - 2091,83$$



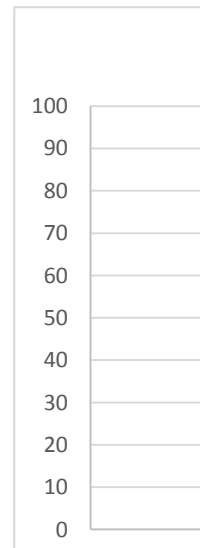
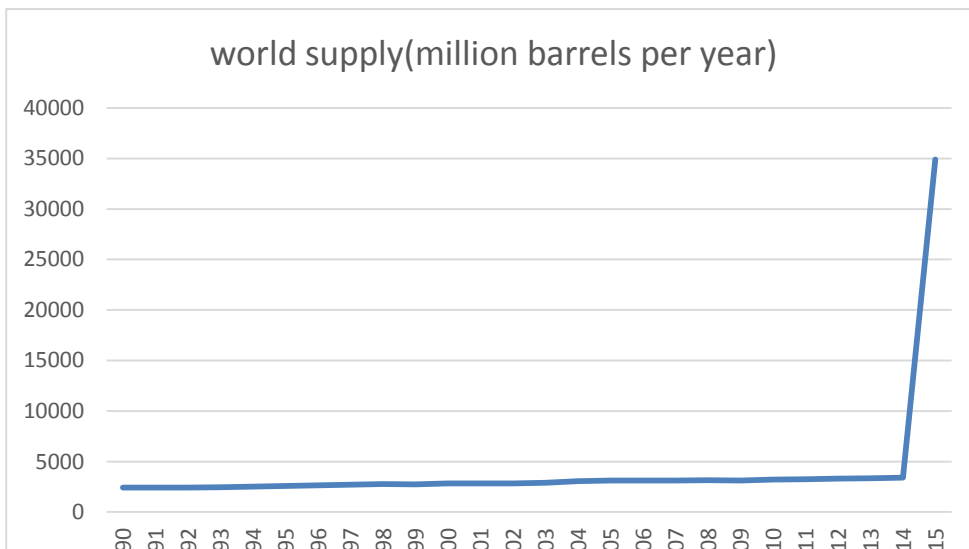
world supply(million barrels per year)

- 2424.914
- 2421.3735
- 2429.1845
- 2449.1865
- 2505.2505
- 2566.1325
- 2627.489
- 2709.03
- 2762.3565
- 2731.587
- 2836.9625
- 2835.028
- 2814.1865
- 2905.619
- 3044.173
- 3106.1135
- 3107.4275
- 3107.245
- 3157.7975
- 3128.1595
- 3215.6135
- 3231.418
- 3302.009
- 3322.011
- 3401.8365
- 34901.3

this deviation describe further growth of this functions
and curve to

$$T(\text{supply})=311,3658*t-86,3845$$

$$T(\text{price})$$



19:
19:
19:
19:
19:
19:
19:
19:
19:
19:
19:
20:
20:
20:
20:
20:
20:
20:
20:
20:
20:
20:
20:
20:
20:
20:
20:
20:
20:
20:

1985

1

Nominal Price \$

