1、利用 1986 年全国 29 个省市自治区的农作物播种面积（*x*，万亩）和产值（y 亿元）（data1）。建立产值的恰当回归模型。

（1）对变量进行单位根检验

首先看X、Y的折线图，发现两个变量都是有**很小的截距，无趋势**，ADF检验两个序列都是平稳的，ADF检验结果如下：

Null Hypothesis: X has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.488885	0.0014
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

Null Hypothesis: Y has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.102179	0.0037
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

（2）对 X、 Y 进行 OLS 估计，结果如下

Dependent Variable: Y
Method: Least Squares
Date: 05/31/17 Time: 10:31
Sample: 1 29
Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.661019	8.924156	-0.634348	0.5312
X	0.012309	0.000989	12.44872	0.0000

R-squared	0.851624	Mean dependent var	86.14828
Adjusted R-squared	0.846129	S.D. dependent var	68.98436
S.E. of regression	27.06008	Akaike info criterion	9.500468
Sum squared resid	19770.70	Schwarz criterion	9.594765
Log likelihood	-135.7568	Hannan-Quinn criter.	9.530001
F-statistic	154.9706	Durbin-Watson stat	2.170375
Prob(F-statistic)	0.000000		

发现常数项不显著，进一步修正

Dependent Variable: Y
Method: Least Squares
Date: 05/31/17 Time: 10:32
Sample: 1 29

Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X	0.011790	0.000551	21.40728	0.0000

R-squared	0.849413	Mean dependent var	86.14828
Adjusted R-squared	0.849413	S.D. dependent var	68.98436
S.E. of regression	26.76975	Akaike info criterion	9.446296
Sum squared resid	20065.35	Schwarz criterion	9.493445
Log likelihood	-135.9713	Hannan-Quinn criter.	9.461063
Durbin-Watson stat	2.096316		

（３）结果表明Ｒ方0.85，ＤＷ值接近２，拟合效果较好。

结果为Y= 0.011790*X

2、考虑 1962 年 1 月至 1999 年 12 月的 CRSP 指数的月对数收益率（data2.xlsx）

①首先进行单位根检验

Null Hypothesis: CRSP has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=17)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-16.40178	0.0000
Test critical values:	1% level	-2.570054	
	5% level	-1.941521	
	10% level	-1.616232	

结果表明该序列是平稳的

②接下来看该序列的自相关系数和偏自相关系数

Sample: 1962M01 1999M12
Included observations: 456

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.226	0.226	23.518	0.000
		2	-0.010	-0.065	23.564	0.000
		3	-0.038	-0.022	24.234	0.000
		4	-0.016	-0.002	24.349	0.000
		5	0.009	0.012	24.388	0.000
		6	-0.009	-0.016	24.424	0.000
		7	-0.056	-0.053	25.862	0.001
		8	-0.108	-0.088	31.272	0.000
		9	-0.007	0.037	31.292	0.000
		10	0.017	0.000	31.423	0.000
		11	0.040	0.032	32.177	0.001
		12	0.104	0.095	37.302	0.000

1）给该序列建立一个 AR 模型，并进行 1 步和 2 步预测

根据相关自相关系数和偏自相关系数，首先建立 AR（1）模型，结果如下：

Dependent Variable: CRSP
Method: Least Squares
Date: 05/31/17 Time: 10:42
Sample (adjusted): 1962M02 1999M12
Included observations: 455 after adjustments
Convergence achieved after 3 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.069163	0.331516	3.225074	0.0014
AR(1)	0.227095	0.045829	4.955257	0.0000

R-squared	0.051417	Mean dependent var	1.063580
Adjusted R-squared	0.049323	S.D. dependent var	5.605513
S.E. of regression	5.465524	Akaike info criterion	6.239183
Sum squared resid	13531.99	Schwarz criterion	6.257294
Log likelihood	-1417.414	Hannan-Quinn criter.	6.246318

F-statistic	24.55457	Durbin-Watson stat	1.968754
Prob(F-statistic)	0.000001		

Inverted AR Roots	.23

然后再看 AR（2）模型的结果

Dependent Variable: CRSP
Method: Least Squares
Date: 05/31/17 Time: 10:43
Sample (adjusted): 1962M03 1999M12
Included observations: 454 after adjustments
Convergence achieved after 3 iterations

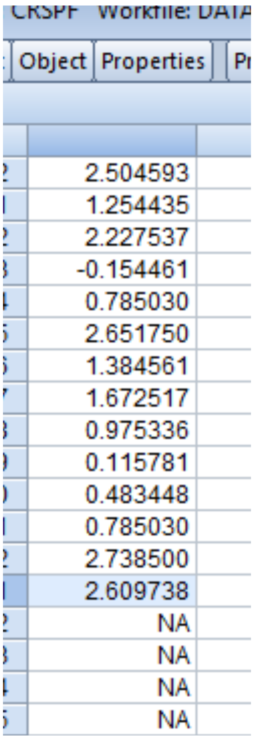
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.063964	0.311843	3.411856	0.0007
AR(1)	0.241579	0.047036	5.136077	0.0000
AR(2)	-0.064260	0.047121	-1.363735	0.1733

R-squared	0.055353	Mean dependent var	1.062548
Adjusted R-squared	0.051164	S.D. dependent var	5.611654
S.E. of regression	5.466211	Akaike info criterion	6.241635
Sum squared resid	13475.64	Schwarz criterion	6.268847
Log likelihood	-1413.851	Hannan-Quinn criter.	6.252356
F-statistic	13.21356	Durbin-Watson stat	2.000597
Prob(F-statistic)	0.000003		

Inverted AR Roots	.12-.22i	.12+.22i

比较发现 AR（1）的 AIC 更小，因此选择，AR（1）模型进行预测

①当进行一步预测时，为了提高预测的准确率，采用静态预测的方式，结果如下：



2.504593
1.254435
2.227537
-0.154461
0.785030
2.651750
1.384561
1.672517
0.975336
0.115781
0.483448
0.785030
2.738500
2.609738
NA
NA
NA
NA

②两步预测时，采用动态预测的方式，预测结果两步结果为：

1999M11	8.420000
1999M12	7.853000
2000M01	2.609738
2000M02	1.419019
2000M03	NA

2）给该序列建立一个 MA 模型，并进行 1 步和 2 步预测

首先估计 MA（1）与 MA（2）模型，并比较 AIC 与 SC 准则，发现 MA（1）更合适，结果如下

Dependent Variable: CRSP
Method: Least Squares
Date: 05/31/17 Time: 10:57
Sample (adjusted): 1962M01 1999M12
Included observations: 456 after adjustments
Convergence achieved after 5 iterations
MA Backcast: 1961M12

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.061394	0.316180	3.356929	0.0009
MA(1)	0.239034	0.045587	5.243483	0.0000

R-squared	0.054539	Mean dependent var	1.059511
Adjusted R-squared	0.052457	S.D. dependent var	5.600024
S.E. of regression	5.451166	Akaike info criterion	6.233913
Sum squared resid	13490.71	Schwarz criterion	6.251994
Log likelihood	-1419.332	Hannan-Quinn criter.	6.241035
F-statistic	26.18910	Durbin-Watson stat	1.995328
Prob(F-statistic)	0.000000		

Inverted MA Roots	-.24

Dependent Variable: CRSP
Method: Least Squares
Date: 05/31/17 Time: 10:57
Sample (adjusted): 1962M01 1999M12
Included observations: 456 after adjustments
Convergence achieved after 7 iterations
MA Backcast: 1961M11 1961M12

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.061563	0.318631	3.331634	0.0009
MA(1)	0.240879	0.047026	5.122303	0.0000
MA(2)	0.006423	0.047125	0.136301	0.8916

R-squared	0.054575	Mean dependent var	1.059511
Adjusted R-squared	0.050401	S.D. dependent var	5.600024
S.E. of regression	5.457075	Akaike info criterion	6.238260
Sum squared resid	13490.19	Schwarz criterion	6.265382
Log likelihood	-1419.323	Hannan-Quinn criter.	6.248944
F-statistic	13.07491	Durbin-Watson stat	1.998591
Prob(F-statistic)	0.000003		

Inverted MA Roots	-.03	-.21

①采用静态预测的方法，一步预测结果为
2000M1　2.252708402484566

②采用动态预测的方法两步预测结果为

1999M12	7.853000
2000M01	2.252708
2000M02	1.061394
2000M03	NA
2000M04	NA

3）比较所拟合的 AR 和 MA 模型

从 AIC 和 SC 的比较结果来看 MA（1）模型的拟合结果更好

Dependent Variable: CRSP
Method: Least Squares
Date: 05/31/17 Time: 10:42
Sample (adjusted): 1962M02 1999M12
Included observations: 455 after adjustments
Convergence achieved after 3 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.069163	0.331516	3.225074	0.0014
AR(1)	0.227095	0.045829	4.955257	0.0000

R-squared	0.051417	Mean dependent var	1.063580
Adjusted R-squared	0.049323	S.D. dependent var	5.605513
S.E. of regression	5.465524	Akaike info criterion	6.239183
Sum squared resid	13531.99	Schwarz criterion	6.257294
Log likelihood	-1417.414	Hannan-Quinn criter.	6.246318
F-statistic	24.55457	Durbin-Watson stat	1.968754
Prob(F-statistic)	0.000001		

Inverted AR Roots	.23

Dependent Variable: CRSP
Method: Least Squares
Date: 05/31/17 Time: 10:57
Sample (adjusted): 1962M01 1999M12
Included observations: 456 after adjustments
Convergence achieved after 5 iterations
MA Backcast: 1961M12

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.061394	0.316180	3.356929	0.0009
MA(1)	0.239034	0.045587	5.243483	0.0000

R-squared	0.054539	Mean dependent var	1.059511
Adjusted R-squared	0.052457	S.D. dependent var	5.600024
S.E. of regression	5.451166	Akaike info criterion	6.233913
Sum squared resid	13490.71	Schwarz criterion	6.251994
Log likelihood	-1419.332	Hannan-Quinn criter.	6.241035
F-statistic	26.18910	Durbin-Watson stat	1.995328

Prob(F-statistic)	0.000000
Inverted MA Roots	-.24

3、利用固定期限为 1 年和 3 年的美国国库券月度数据（data3）

首先对原始数据进行单位根检验，都是有截距有趋势的序列，检验下来均不平稳，然后进行一阶差分，发现一阶差分均为平稳序列，结果如下

Null Hypothesis: DONEYEAR has a unit root
Exogenous: None
Lag Length: 5 (Automatic - based on SIC, maxlag=18)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.25176	0.0000
Test critical values:	1% level	-2.568790	
	5% level	-1.941347	
	10% level	-1.616347	

Null Hypothesis: DTHREEYEAR has a unit root
Exogenous: None
Lag Length: 5 (Automatic - based on SIC, maxlag=18)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.17235	0.0000
Test critical values:	1% level	-2.568790	
	5% level	-1.941347	
	10% level	-1.616347	

1）为该二元利率序列识别一个 VAR 模型

比较多种准则，发现滞后6阶的效果最好，因此对d(oneyear)与d(threeyear)建立VAR（6）的模型，比较结果如下：

VAR Lag Order Selection Criteria
Endogenous variables: DONEYEAR DTHREEYEAR
Exogenous variables: C
Date: 05/31/17 Time: 11:17
Sample: 1953M04 2004M03
Included observations: 605

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-11.70602	NA	0.003587	0.045309	0.059872	0.050976
1	41.90975	106.6998	0.003044	-0.118710	-0.075022	-0.101709
2	67.34063	50.44140	0.002836	-0.189556	-0.116742*	-0.161221
3	74.02318	13.21047	0.002811	-0.198424	-0.096485	-0.158756
4	79.69481	11.17452	0.002796	-0.203950	-0.072885	-0.152948
5	87.02850	14.40069	0.002765	-0.214970	-0.054780	-0.152635
6	110.7653	46.45359*	0.002590*	-0.280216*	-0.090900	-0.206547*

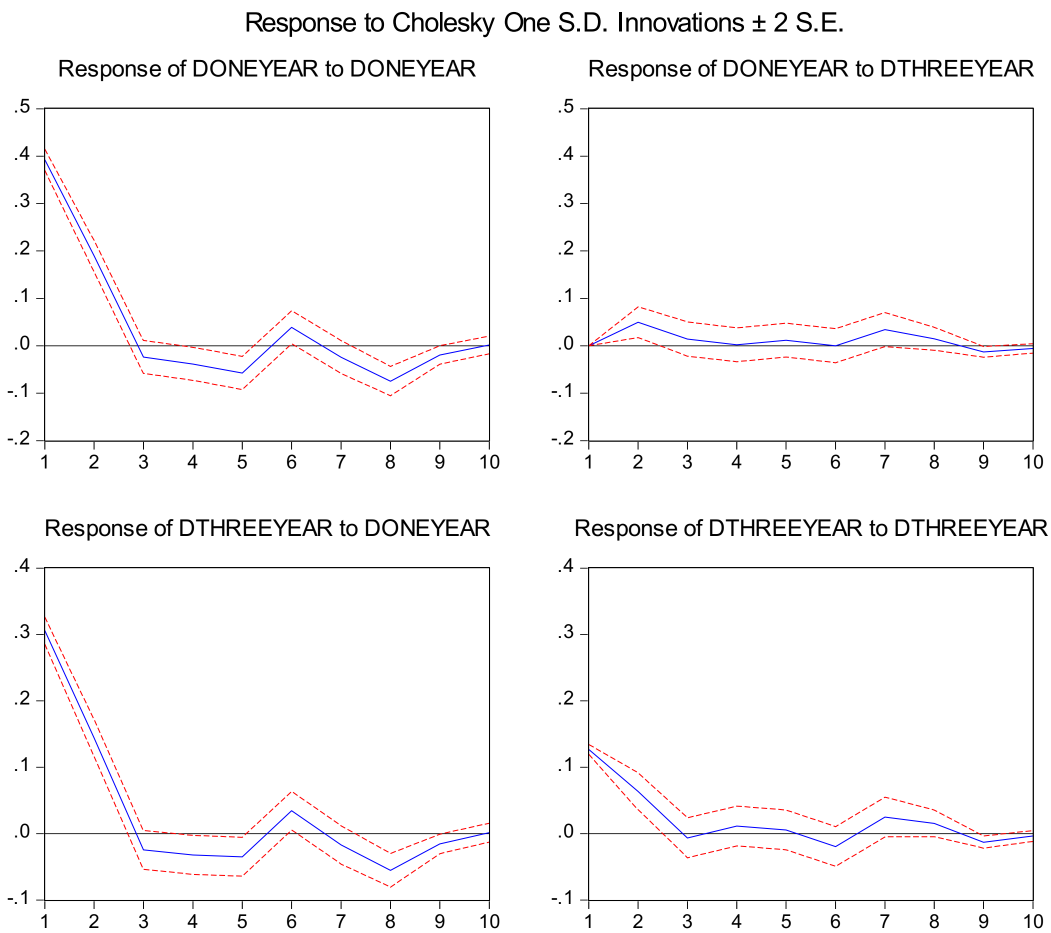
模型结果如下：

Vector Autoregression Estimates
Date: 05/31/17 Time: 11:20
Sample (adjusted): 1953M11 2004M03
Included observations: 605 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	DONEYEAR	DTHREEYEAR
DONEYEAR(-1)	0.178439	-0.023707
	(0.10658)	(0.08998)
	[1.67419]	[-0.26347]
DONEYEAR(-2)	-0.169211	-0.006431
	(0.10797)	(0.09115)
	[-1.56719]	[-0.07056]
DONEYEAR(-3)	-0.048573	-0.149605
	(0.10862)	(0.09170)
	[-0.44719]	[-1.63151]
DONEYEAR(-4)	-0.156375	-0.024327
	(0.10892)	(0.09196)
	[-1.43563]	[-0.26456]
DONEYEAR(-5)	0.168588	0.206070
	(0.10828)	(0.09142)
	[1.55690]	[2.25422]
DONEYEAR(-6)	-0.458925	-0.356966
	(0.10549)	(0.08905)
	[-4.35048]	[-4.00839]
DTHREEYEAR(-1)	0.391057	0.501498
	(0.12733)	(0.10750)
	[3.07117]	[4.66531]
DTHREEYEAR(-2)	-0.155110	-0.293548
	(0.12989)	(0.10965)
	[-1.19417]	[-2.67704]
DTHREEYEAR(-3)	0.160033	0.267169
	(0.13139)	(0.11092)
	[1.21799]	[2.40861]
DTHREEYEAR(-4)	0.005243	-0.090806
	(0.13157)	(0.11108)
	[0.03985]	[-0.81751]
DTHREEYEAR(-5)	0.055762	-0.062063
	(0.13013)	(0.10985)
	[0.42853]	[-0.56496]
DTHREEYEAR(-6)	0.261498	0.214788
	(0.12813)	(0.10817)
	[2.04087]	[1.98566]
C	-0.001545	-0.000785
	(0.01596)	(0.01347)

	[-0.09678]	[-0.05828]
R-squared	0.264731	0.241883
Adj. R-squared	0.249827	0.226516
Sum sq. resids	91.19853	64.99699
S.E. equation	0.392494	0.331349
F-statistic	17.76227	15.74020
Log likelihood	-286.0704	-183.6143
Akaike AIC	0.988663	0.649965
Schwarz SC	1.083320	0.744623
Mean dependent	-0.000992	-0.000380
S.D. dependent	0.453161	0.376756
Determinant resid covariance (dof adj.)		0.002483
Determinant resid covariance		0.002377
Log likelihood		110.7653
Akaike information criterion		-0.280216
Schwarz criterion		-0.090900

2）计算所拟合的 VAR 模型的广义脉冲响应函数



3）检验序列是否存在协整关系，如果存在建立 VECM 模型

对滞后5阶进行协整检验，发现具有协整关系

Date: 01/01/09 Time: 02:42
Sample (adjusted): 1953M11 2004M03
Included observations: 605 after adjustments
Trend assumption: Linear deterministic trend
Series: DONEYEAR DTHREEYEAR
Lags interval (in first differences): 1 to 5

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.222001	252.6715	15.49471	0.0001
At most 1 *	0.153469	100.7984	3.841466	0.0000

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

VCEM 模型

Vector Error Correction Estimates
Date: 01/01/09 Time: 03:06
Sample (adjusted): 1953M11 2004M03
Included observations: 605 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
DONEYEAR(-1)	1.000000	
DTHREEYEAR(-1)	-0.841748	
	(0.03688)	
	[-22.8230]	
C	0.001155	
Error Correction:	**D(DONEYEAR)**	**D(DTHREEYEAR)**
CointEq1	-2.182227	-1.351042
	(0.19065)	(0.16609)
	[-11.4460]	[-8.13429]
D(DONEYEAR(-1))	1.209741	1.111393
	(0.18105)	(0.15773)
	[6.68170]	[7.04629]
D(DONEYEAR(-2))	0.946322	0.970171
	(0.16601)	(0.14462)
	[5.70033]	[6.70822]
D(DONEYEAR(-3))	0.784563	0.658618
	(0.15383)	(0.13401)
	[5.10033]	[4.91476]
D(DONEYEAR(-4))	0.524342	0.485709
	(0.12768)	(0.11123)
	[4.10682]	[4.36682]
D(DONEYEAR(-5))	0.585996	0.538779

	(0.10355)	(0.09021)
	[5.65927]	[5.97274]
D(DTHREEYEAR(-1))	-1.214922	-1.305361
	(0.17440)	(0.15193)
	[-6.96622]	[-8.59167]
D(DTHREEYEAR(-2))	-1.217602	-1.380815
	(0.16900)	(0.14723)
	[-7.20480]	[-9.37885]
D(DTHREEYEAR(-3))	-0.874403	-0.851573
	(0.16857)	(0.14685)
	[-5.18724]	[-5.79889]
D(DTHREEYEAR(-4))	-0.692278	-0.689297
	(0.14410)	(0.12553)
	[-4.80426]	[-5.49099]
D(DTHREEYEAR(-5))	-0.477972	-0.524517
	(0.12123)	(0.10561)
	[-3.94262]	[-4.96639]
C	0.000288	-0.000209
	(0.01623)	(0.01414)
	[0.01778]	[-0.01478]
R-squared	0.408467	0.361918
Adj. R-squared	0.397494	0.350081
Sum sq. resids	94.47172	71.69774
S.E. equation	0.399138	0.347717
F-statistic	37.22545	30.57700
Log likelihood	-296.7371	-213.2951
Akaike AIC	1.020619	0.744777
Schwarz SC	1.107995	0.832154
Mean dependent	0.000595	0.000132
S.D. dependent	0.514213	0.431316

Determinant resid covariance (dof adj.)	0.002923
Determinant resid covariance	0.002808
Log likelihood	60.36612
Akaike information criterion	-0.113607
Schwarz criterion	0.075709

4、利用美国 10 个州 1963——1992 年的香烟消费量相关变量建立香烟消费模型；lnc（人均香烟消费量的对数）；lnp（实际香烟价格的对数）；lnpmin（相邻州最低香烟价格的对数）；lny（人均可支配收入）；state（州）；year（年）。建立恰当模型，并做必要解释。

scalar f2=(s3-s1)/s1/36*260 **88.102**
scalar f2c=@qfdist(0.95,36,260) **1.45**
scalar f1=(s2-s1)/s1*260/27 **41.58**
scalar f1c=@qfdist **1.528**

拒绝 H2、H1 为变系数模型

结果 F2>F2C F1>F1C 接受 H0。表明是变系数模型

比较下来是变系数模型，结果如下：

Dependent Variable: LNC?
Method: Pooled Least Squares
Date: 01/01/09 Time: 02:55
Sample: 1963 1992
Included observations: 30
Cross-sections included: 10
Total pool (balanced) observations: 300

Variable	Coefficient	Std. Error	t-Statistic	Prob.
_1--LNP_1	-0.701180	0.267939	-2.616943	0.0094
_2--LNP_2	-0.091003	0.185826	-0.489720	0.6247
_3--LNP_3	-0.097547	0.232034	-0.420400	0.6745
_4--LNP_4	-0.536980	0.124493	-4.313342	0.0000
_5--LNP_5	-0.824444	0.142600	-5.781523	0.0000
_6--LNP_6	-0.184485	0.144956	-1.272691	0.2043
_7--LNP_7	-0.445522	0.212431	-2.097252	0.0369
_8--LNP_8	-0.303695	0.159200	-1.907632	0.0575
_9--LNP_9	-0.118377	0.220820	-0.536080	0.5924
_10--LNP_10	-1.272055	0.211310	-6.019850	0.0000
_1--LNPMIN_1	0.198223	0.291128	0.680880	0.4966
_2--LNPMIN_2	-0.560730	0.170181	-3.294901	0.0011
_3--LNPMIN_3	-0.291544	0.238901	-1.220358	0.2234
_4--LNPMIN_4	-0.219820	0.161649	-1.359863	0.1751
_5--LNPMIN_5	0.316402	0.129596	2.441458	0.0153
_6--LNPMIN_6	-0.101334	0.139788	-0.724912	0.4692
_7--LNPMIN_7	0.097704	0.122081	0.800323	0.4243
_8--LNPMIN_8	-0.263209	0.165095	-1.594285	0.1121
_9--LNPMIN_9	-0.397214	0.197239	-2.013876	0.0451
_10--LNPMIN_10	0.519078	0.230432	2.252625	0.0251
_1--LNY_1	0.096100	0.015358	6.257488	0.0000
_2--LNY_2	-0.073839	0.015553	-4.747413	0.0000
_3--LNY_3	0.126112	0.014177	8.895389	0.0000
_4--LNY_4	-0.191033	0.016937	-11.27881	0.0000
_5--LNY_5	-0.126899	0.016895	-7.511274	0.0000
_6--LNY_6	-0.115773	0.015039	-7.698395	0.0000
_7--LNY_7	-0.445767	0.034812	-12.80497	0.0000
_8--LNY_8	-0.050021	0.017082	-2.928353	0.0037
_9--LNY_9	0.073835	0.014313	5.158513	0.0000
_10--LNY_10	-0.006818	0.015468	-0.440774	0.6597
_1--C	6.147890	0.410451	14.97837	0.0000
_2--C	8.259610	0.354427	23.30409	0.0000

_3--C	5.404266	0.372865	14.49389	0.0000
_4--C	9.837761	0.356431	27.60071	0.0000
_5--C	8.285885	0.345311	23.99540	0.0000
_6--C	7.306980	0.394960	18.50058	0.0000
_7--C	10.60481	0.333308	31.81686	0.0000
_8--C	7.847737	0.408259	19.22246	0.0000
_9--C	6.408721	0.411689	15.56691	0.0000
_10--C	8.088156	0.334677	24.16708	0.0000

R-squared	0.945055	Mean dependent var	4.792591
Adjusted R-squared	0.936814	S.D. dependent var	0.207179
S.E. of regression	0.052078	Akaike info criterion	-2.948566
Sum squared resid	0.705162	Schwarz criterion	-2.454729
Log likelihood	482.2849	Hannan-Quinn criter.	-2.750932
F-statistic	114.6676	Durbin-Watson stat	0.901352
Prob(F-statistic)	0.000000		