BAB V

KESIMPULAN DAN SARAN

Sebagai penutup dari thesis ini, akan disajikan kesimpulan dari hasil penelitian dan pembahasan pada bab sebelumnya. Kemudian, akan di sampaikan pula saran yang didasarkan pada hasil kesimpulan. Saran dalam hasil penelitian ini diharapkan dapat bermanfaat bagi investor dan beberapa pihak sebagai masukan atau dasar pengambilan keputusan untuk memilih model mana yang baik untuk melihat *optimal hedge* dan efektifitas *hedging* untuk kontrak *futures* komoditi Emas dimasa yang akan datang.

Penelitian ini dimaksudkan untuk mencari *optimal hedge ratio* dari empat model yaitu OLS, VAR, VECM, dan M-GARCH. Setelah diketahui nilai *optimal hedge*-nya lalu di mencari efektivitas *hedging* dari keempat model ini. Penelitian ini di bagi menjadi dua bagian, yang pertama *in-sample* dengan data yang digunakan adalah data harian indeks *spot* dan *futures* komoditi Emas dari tanggal 1 Mei tahun 2009 sampai dengan 31 Desember 2013. Kemudian yang kedua data *out of sample* kontrak *spot* dan *futures* komoditi Emas pada tanggal 1 Januari sampai 28 Maret 2013.

5.1 Kesimpulan

Penelitian ini dilakukan untuk mengkaji *optimal hedge ratio* dan efektivitas *hedging* kontrak *futures* komoditi Emas dengan empat model ekonometrika yang berbeda yaitu OLS, VAR, VECM dan M-GARCH. Periode data dalam penelitian ini di bagi menjadi dua bagian yaitu periode *in-sample* dengan periode penelitian yang cukup periode datanya cukup panjang mulai 1 Mei 2009 sampai dengan 31 Desember 2012, kemudian periode *out-of-sample* yang periode penelitiannya lebih singkat mulai 1 Januari 2013 sampai 28 Maret 2013.

Hasil empiris menunjukan bahwa untuk periode *in-sample* model M-GARCH menunjukan kinerja yang lebih baik kerena mengungguli tiga model lain untuk perhitungan *optimal hedge* dan efektivitas *hedging*nya. Berbeda dengan data pada bagian ke dua atau *out of sample* dengan periode data yang lebih singkat hasil perhitungan *optimal hedge* dalam periode ini menemukan bahwa model OLS lebih unggul tetapi untuk perhitungan efektivitas *hedging* model M-GARCH tetap menunjukan kinerja yang lebih baik dari ketiga model lainnya. Temuan ini menyiratkan bahwa dalam pemilihan rasio lindung nilai yang paling tepat adalah penting bagi investor dengan tipe penghindar risiko. Perhitungan untuk mencari *optimal hedge ratio* dalam jangka panjang dapat menggunakan model M-GARCH, sedangkan untuk jangka yang lebih pendek atau singkat dapat menggunakan model OLS.

5.2 Saran

Penelitian ini meneliti tentang *optimal hedge ratio* dan efektivitas *hedging* kontrak *futures* komoditi emas dengan menggunakan empat model yaitu *Ordinary Least Square* (OLS), *Vector Auto Regressive* (VAR), *Vector Error Correction Model* (VECM), dan *Multivariate Generalized Autoregressive Conditional Heterokedasticity* (M-GARCH). Saran untuk penelitian-penelitian selanjutnya selain menggunakan empat model di atas, penelitian selanjutnya juga dapat juga menggunakan model ekonometrika lain untuk mengestimasi *optimal hedge ratio* yaitu model BEKK, EWMA, VGARCH dan TARCH untuk mencari model terbaik sebagai sarana lindung nilai.

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LAMPIRAN

LAMPIRAN 1

Lampiran data *In-sample*

Uji ADF data *Spot In-sample*

Null Hypothesis: SPOT has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=21)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.628429	0.4676
Test critical values:	1% level	-3.436969	
	5% level	-2.864351	
	10% level	-2.568319	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPOT)
Method: Least Squares
Date: 09/21/13 Time: 11:34
Sample (adjusted): 5/04/2009 12/31/2012
Included observations: 956 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPOT(-1)	-0.002862	0.001758	-1.628429	0.1038
C	4.826258	2.508925	1.923636	0.0547

R-squared	0.002772	Mean dependent var	0.817406
Adjusted R-squared	0.001727	S.D. dependent var	14.97888
S.E. of regression	14.96595	Akaike info criterion	8.251522
Sum squared resid	213676.5	Schwarz criterion	8.261695
Log likelihood	-3942.227	Hannan-Quinn criter.	8.255397
F-statistic	2.651780	Durbin-Watson stat	1.943274
Prob(F-statistic)	0.103764		

Uji ADF data *futures in-sample*

Null Hypothesis: FUTURES has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=21)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.615521	0.4742
Test critical values:	1% level	-3.436969	
	5% level	-2.864351	
	10% level	-2.568319	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FUTURES)
Method: Least Squares
Date: 09/21/13 Time: 11:43
Sample (adjusted): 5/04/2009 12/31/2012
Included observations: 956 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FUTURES(-1)	-0.003245	0.002009	-1.615521	0.1065
C	5.371595	2.868275	1.872761	0.0614

R-squared	0.002728	Mean dependent var	0.823849
Adjusted R-squared	0.001683	S.D. dependent var	17.02233
S.E. of regression	17.00800	Akaike info criterion	8.507334
Sum squared resid	275965.5	Schwarz criterion	8.517508
Log likelihood	-4064.506	F-statistic	2.609907
Durbin-Watson stat	2.090866	Prob(F-statistic)	0.106529

Uji ADF *Return* dari *Spot in-sample*

Null Hypothesis: RS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=21)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-30.34571	0.0000
Test critical values:	1% level	-3.436969	
	5% level	-2.864351	
	10% level	-2.568319	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RS)
Method: Least Squares
Date: 09/21/13 Time: 11:28
Sample (adjusted): 5/04/2009 12/31/2012
Included observations: 956 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RS(-1)	-0.981061	0.032329	-30.34571	0.0000
C	-0.000601	0.000330	-1.821642	0.0688

R-squared	0.491163	Mean dependent var	-1.84E-05
Adjusted R-squared	0.490629	S.D. dependent var	0.014263
S.E. of regression	0.010179	Akaike info criterion	-6.334848
Sum squared resid	0.098850	Schwarz criterion	-6.324675
Log likelihood	3030.058	Hannan-Quinn criter.	-6.330974
F-statistic	920.8619	Durbin-Watson stat	1.997771
Prob(F-statistic)	0.000000		

Uji ADF *Return* dari *Futures data in-sample*

Null Hypothesis: RF has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=21)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-31.99565	0.0000
Test critical values:	1% level	-3.436969	
	5% level	-2.864351	
	10% level	-2.568319	

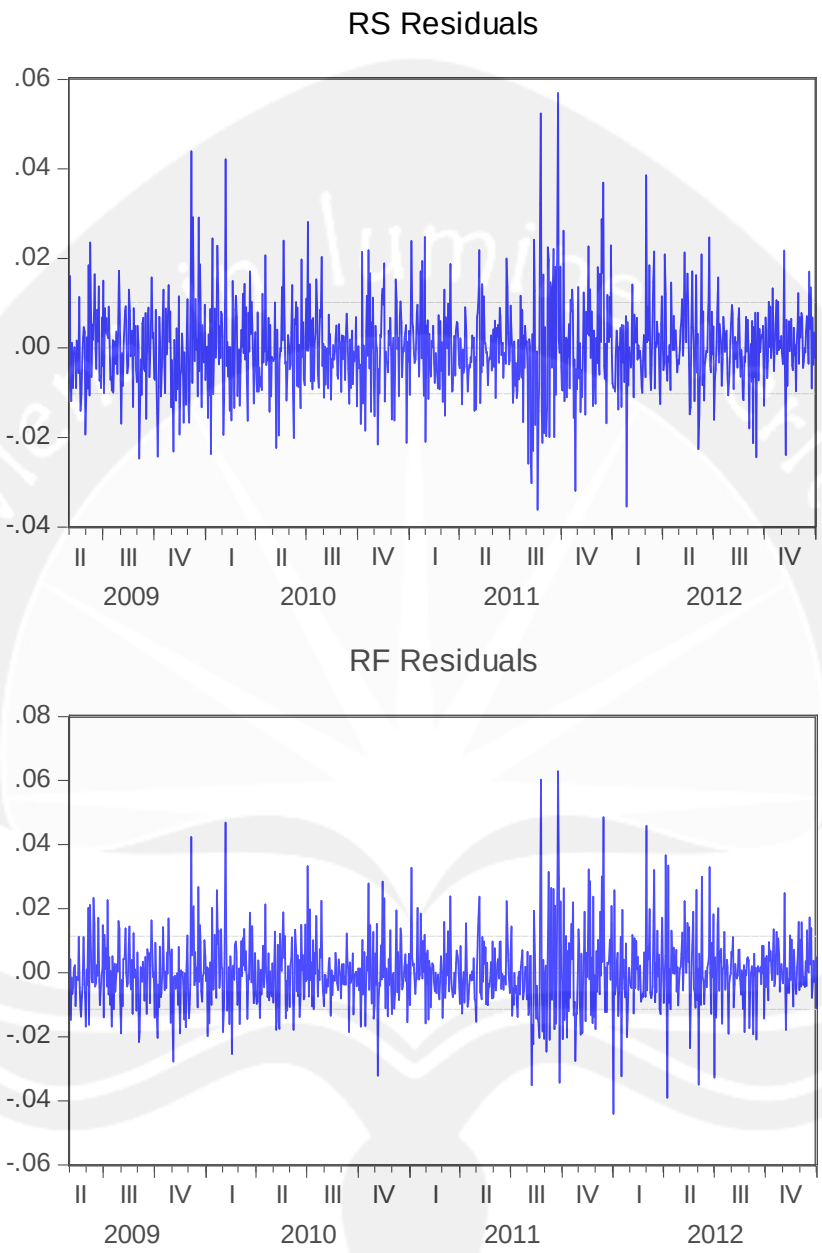
*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 09/21/13 Time: 11:30
Sample (adjusted): 5/04/2009 12/31/2012
Included observations: 956 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-1.035703	0.032370	-31.99565	0.0000
C	-0.000620	0.000369	-1.678679	0.0935

R-squared	0.517627	Mean dependent var	-1.60E-05
Adjusted R-squared	0.517121	S.D. dependent var	0.016412
S.E. of regression	0.011404	Akaike info criterion	-6.107543
Sum squared resid	0.124078	Schwarz criterion	-6.097370
Log likelihood	2921.406	Hannan-Quinn criter.	-6.103668
F-statistic	1023.721	Durbin-Watson stat	1.997817
Prob(F-statistic)	0.000000		

Gambar *Residual* dari *Return spot* dan *futures* data *In-sample*



Estimas Model *OLS in-sample*

Dependent Variable: RS
Method: Least Squares
Date: 09/21/13 Time: 18:24
Sample: 5/01/2009 12/31/2012
Included observations: 957

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF	0.212827	0.028068	7.582561	0.0000

R-squared	0.053502	Mean dependent var	-0.000595
Adjusted R-squared	0.053502	S.D. dependent var	0.010183
S.E. of regression	0.009907	Akaike info criterion	-6.390058
Sum squared resid	0.093835	Schwarz criterion	-6.384975
Log likelihood	3058.643	Durbin-Watson stat	2.347062

Estimasi penentuan Lag VAR data *in-sample*

VAR Lag Order Selection Criteria
Endogenous variables: RS RF
Exogenous variables: C
Date: 09/27/13 Time: 10:23
Sample: 5/01/2009 12/31/2012
Included observations: 949

Lag	LogL	LR	FPE	AIC	SC	HQ
0	5930.008	NA	1.29e-08	-12.49317	-12.48293	-12.48927
1	6480.872	1098.245	4.06e-09	-13.64567	-13.61498	-13.63398
2	6563.754	164.8917	3.44e-09	-13.81192	-13.76075	-13.79242
3	6621.806	115.2475	3.07e-09	-13.92583	-13.85420	-13.89854
4	6639.654	35.35674	2.98e-09	-13.95501	-13.86292	-13.91992
5	6658.217	36.69479	2.89e-09	-13.98570	-13.87314*	-13.94282
6	6669.072	21.41443	2.85e-09	-14.00015	-13.86713	-13.94947
7	6678.706	18.96234	2.82e-09	-14.01203	-13.85853	-13.95354
8	6691.688	25.49905*	2.76e-09*	-14.03095*	-13.85700	-13.96467*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion
Covarian
Matrix

Estimasi VAR Models

Vector Autoregression Estimates
Date: 09/27/13 Time: 11:07
Sample (adjusted): 5/13/2009 12/31/2012
Included observations: 949 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	RS	RF
RS(-1)	-0.782070	0.044175
	(0.03818)	(0.08202)
	[-20.4858]	[0.53858]
RS(-2)	-0.655281	-0.071799
	(0.04800)	(0.10312)
	[-13.6526]	[-0.69625]
RS(-3)	-0.507622	-0.086539
	(0.05239)	(0.11255)
	[-9.68995]	[-0.76887]
RS(-4)	-0.432104	0.043394
	(0.05303)	(0.11394)
	[-8.14772]	[0.38084]
RS(-5)	-0.318341	0.035080
	(0.05232)	(0.11241)
	[-6.08428]	[0.31206]
RS(-6)	-0.219672	0.018097
	(0.04754)	(0.10214)
	[-4.62082]	[0.17718]
RS(-7)	-0.137569	0.019868
	(0.03941)	(0.08468)
	[-3.49056]	[0.23464]
RS(-8)	-0.023992	0.074387
	(0.01840)	(0.03952)
	[-1.30417]	[1.88205]
RF(-1)	0.885132	-0.045225
	(0.01785)	(0.03834)
	[49.5973]	[-1.17948]
RF(-2)	0.693970	-0.036629

	(0.03844)	(0.08259)
	[18.0531]	[-0.44351]
RF(-3)	0.624015	0.010826
	(0.04596)	(0.09874)
	[13.5778]	[0.10964]
RF(-4)	0.500845	0.061872
	(0.05005)	(0.10754)
	[10.0063]	[0.57534]
RF(-5)	0.409071	-0.052761
	(0.05093)	(0.10943)
	[8.03188]	[-0.48216]
RF(-6)	0.297176	-0.054226
	(0.04937)	(0.10607)
	[6.01975]	[-0.51125]
RF(-7)	0.220592	-0.014613
	(0.04375)	(0.09400)
	[5.04223]	[-0.15546]
RF(-8)	0.118568	-0.050586
	(0.03380)	(0.07262)
	[3.50779]	[-0.69657]
C	-0.000244	-0.000619
	(0.00018)	(0.00038)
	[-1.38944]	[-1.64362]

R-squared	0.732083	0.015298
Adj. R-squared	0.727484	-0.001607
Sum sq. resids	0.026414	0.121931
S.E. equation	0.005324	0.011438
F-statistic	159.1682	0.904946
Log likelihood	3630.581	2904.809
Akaike AIC	-7.615556	-6.086005
Schwarz SC	-7.528578	-5.999027
Mean dependent	-0.000579	-0.000562
S.D. dependent	0.010198	0.011429

Determinant resid covariance (dof adj.)	2.67E-09
Determinant resid covariance	2.57E-09
Log likelihood	6691.688
Akaike information criterion	-14.03095
Schwarz criterion	-13.85700

Hasil *Variance* dan *Covariance* model VAR

Covariance Matrix		
	RS	RF
RS	0.000028	0.000032
RF	0.000032	0.000131

Hasil perhitungan efektivitas *Hedging In-sample VAR model*

	Value
σ_s	0.000028
σ_f	0.000131
σ_{sf}	0.000032
VarU	0.000028
VarH	0.0000223
HE (*hedging effectiveness*)	0.2559882

VEC Model ***data in-sample***

Vector Error Correction Estimates
Date: 09/27/13 Time: 11:07
Sample (adjusted): 5/14/2009 12/31/2012
Included observations: 948 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
RS(-1)	1.000000
RF(-1)	-0.997292 (0.01024) [-97.3719]
C	2.80E-05

Error Correction:	D(RS)	D(RF)
CointEq1	-4.131826 (0.29402) [-14.0529]	0.832749 (0.65167) [1.27786]
D(RS(-1))	2.349206 (0.27475) [8.55020]	-0.760106 (0.60898) [-1.24817]
D(RS(-2))	1.685494 (0.24455) [6.89224]	-0.803053 (0.54203) [-1.48157]
D(RS(-3))	1.166911 (0.20787) [5.61365]	-0.845213 (0.46073) [-1.83450]
D(RS(-4))	0.723690 (0.16776) [4.31394]	-0.731879 (0.37182) [-1.96836]
D(RS(-5))	0.396069 (0.12616) [3.13954]	-0.608134 (0.27961) [-2.17490]
D(RS(-6))	0.156115	-0.498093

	(0.08465)	(0.18763)
	[1.84416]	[-2.65466]
D(RS(-7))	-0.000799	-0.365192
	(0.04782)	(0.10598)
	[-0.01670]	[-3.44582]
D(RS(-8))	-0.044521	-0.148588
	(0.01791)	(0.03970)
	[-2.48565]	[-3.74285]
D(RF(-1))	-3.209251	-0.125804
	(0.28779)	(0.63786)
	[-11.1515]	[-0.19723]
D(RF(-2))	-2.482823	-0.081629
	(0.26631)	(0.59026)
	[-9.32310]	[-0.13829]
D(RF(-3))	-1.820134	0.005496
	(0.23545)	(0.52186)
	[-7.73040]	[0.01053]
D(RF(-4))	-1.277277	0.131578
	(0.19831)	(0.43954)
	[-6.44091]	[0.29936]
D(RF(-5))	-0.828789	0.116929
	(0.15778)	(0.34971)
	[-5.25276]	[0.33436]
D(RF(-6))	-0.487776	0.088434
	(0.11502)	(0.25494)
	[-4.24065]	[0.34688]
D(RF(-7))	-0.215167	0.092226
	(0.07274)	(0.16122)
	[-2.95818]	[0.57207]
D(RF(-8))	-0.048560	0.029006
	(0.03472)	(0.07695)
	[-1.39871]	[0.37695]
C	5.70E-05	1.24E-05
	(0.00018)	(0.00039)
	[0.32444]	[0.03184]

R-squared	0.859458	0.479414
Adj. R-squared	0.856889	0.469898
Sum sq. resids	0.027169	0.133469
S.E. equation	0.005405	0.011980
F-statistic	334.5443	50.37937
Log likelihood	3612.905	2858.391
Akaike AIC	-7.584188	-5.992385
Schwarz SC	-7.492017	-5.900214
Mean dependent	7.82E-06	-1.02E-05
S.D. dependent	0.014288	0.016454

Determinant resid covariance (dof adj.)	2.92E-09
Determinant resid covariance	2.81E-09
Log likelihood	6643.183
Akaike information criterion	-13.93499
Schwarz criterion	-13.74040

Hasil *Variance* dan *Covariance* VECM

Covariance Matrix		
	RS	RF
RS	0.000029	0.000036
RF	0.000036	0.000144

Hasil perhitungan efektivitas *Hedging In-sample VEC model*

	Value
σ_s	0.000031
σ_f	0.000144
σ_{sf}	0.000036
VarU	0.000029
VarH	0.000022
HE (*hedging effectiveness*)	0.3068907

Multivariate GARCH data in sample

System: UNTITLED
Estimation Method: ARCH Maximum Likelihood (Marquardt)
Covariance specification: Diagonal VECH
Date: 09/27/13 Time: 11:53
Sample: 5/01/2009 12/31/2012
Included observations: 957
Total system (balanced) observations 1914
Presample covariance: backcast (parameter =0.7)
Convergence achieved after 11 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	-0.000549	0.000312	-1.761110	0.0782
C(2)	-0.000584	0.000335	-1.744653	0.0810

Variance Equation Coefficients

C(3)	3.14E-06	1.11E-06	2.834149	0.0046
C(4)	2.52E-06	3.57E-06	0.706725	0.4797
C(5)	2.34E-06	6.82E-07	3.428896	0.0006
C(6)	0.045874	0.008810	5.207112	0.0000
C(7)	0.012196	0.013010	0.937441	0.3485
C(8)	0.039958	0.006278	6.364434	0.0000
C(9)	0.922521	0.016617	55.51771	0.0000
C(10)	0.883863	0.149515	5.911530	0.0000
C(11)	0.941993	0.008381	112.3991	0.0000

Log likelihood	6064.850	Schwarz criterion	-12.59582
Avg. log likelihood	3.168678	Hannan-Quinn criter.	-12.63043
Akaike info criterion	-12.65172		

Equation: RS = C(1)

R-squared	-0.000021	Mean dependent var	-0.000595
Adjusted R-squared	-0.000021	S.D. dependent var	0.010183
S.E. of regression	0.010184	Sum squared resid	0.099141
Durbin-Watson stat	1.959502		

Equation: RF = C(2)

R-squared	-0.000001	Mean dependent var	-0.000595
Adjusted R-squared	-0.000001	S.D. dependent var	0.011400
S.E. of regression	0.011400	Sum squared resid	0.124252
Durbin-Watson stat	2.070180		

Covariance specification: Diagonal VECH
GARCH = M + A1.*RESID(-1)*RESID(-1)' + B1.*GARCH(-1)
M is an indefinite matrix
A1 is an indefinite matrix
B1 is an indefinite matrix

Transformed Variance Coefficients

	Coefficient	Std. Error	z-Statistic	Prob.

M(1,1)	3.14E-06	1.11E-06	2.834149	0.0046
M(1,2)	2.52E-06	3.57E-06	0.706725	0.4797
M(2,2)	2.34E-06	6.82E-07	3.428896	0.0006
A1(1,1)	0.045874	0.008810	5.207112	0.0000
A1(1,2)	0.012196	0.013010	0.937441	0.3485
A1(2,2)	0.039958	0.006278	6.364434	0.0000
B1(1,1)	0.922521	0.016617	55.51771	0.0000
B1(1,2)	0.883863	0.149515	5.911530	0.0000
B1(2,2)	0.941993	0.008381	112.3991	0.0000

Hasil *Variance* dan *Covariance* model M-GARCH

Covariance Matrix		
	RS	RF
RS	0.000130	0.000027
RF	0.000027	0.000104

Hasil perhitungan efektivitas *Hedging* In-sample M-GARCH model

	Value
h_{sst}	0.000130
h_{fft}	0.000104
h_{sft}	0.000027
VarU	0.000130
VarH	0.000090
HE (*hedging effectiveness*)	0.307544

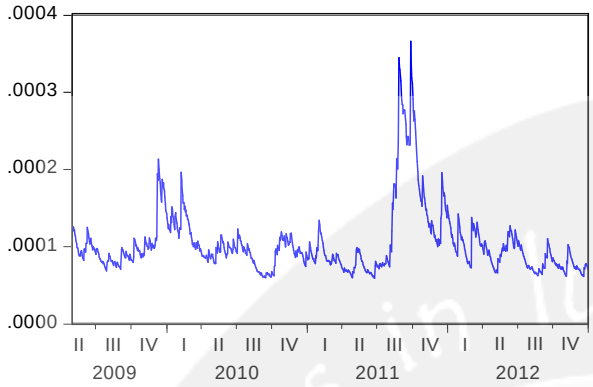
Colegram MGARCH

Date: 09/29/13 Time: 12:34
Sample: 5/01/2009 12/31/2012
Included observations: 957

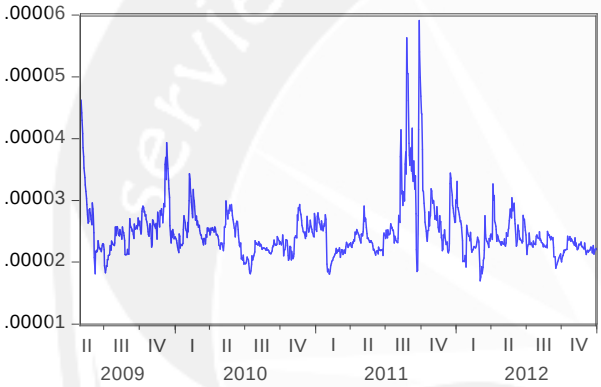
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
| |	| |	1	0.019	0.019	0.3443	0.557
| |	| |	2	0.025	0.025	0.9582	0.619
| |	| |	3	-0.030	-0.031	1.8390	0.606
| |	| |	4	-0.041	-0.040	3.4338	0.488
| |	| |	5	0.014	0.017	3.6187	0.606
| |	| |	6	-0.014	-0.014	3.8196	0.701
| |	| |	7	-0.007	-0.010	3.8692	0.795
| |	| |	8	-0.028	-0.028	4.6542	0.794
|* |	|* |	9	0.077	0.080	10.455	0.315
| |	| |	10	0.052	0.049	13.030	0.222
| |	| |	11	0.005	-0.003	13.057	0.290
| |	| |	12	-0.018	-0.019	13.380	0.342
| |	| |	13	-0.006	0.005	13.415	0.416
| |	| |	14	-0.039	-0.038	14.910	0.384
| |	| |	15	-0.032	-0.033	15.933	0.387
| |	| |	16	-0.040	-0.037	17.470	0.356
| |	| |	17	0.030	0.038	18.346	0.367
| |	| |	18	0.040	0.033	19.903	0.338
| |	| |	19	-0.008	-0.023	19.962	0.397
| |	| |	20	0.043	0.038	21.803	0.351
| |	| |	21	-0.033	-0.026	22.901	0.349
| |	| |	22	-0.001	-0.004	22.903	0.407
| |	| |	23	-0.033	-0.029	23.999	0.404
| |	| |	24	0.022	0.034	24.497	0.434
| |	| |	25	-0.042	-0.034	26.200	0.397
| |	| |	26	-0.039	-0.040	27.677	0.375
| |	| |	27	0.001	-0.007	27.678	0.428
| |	| |	28	-0.040	-0.038	29.222	0.401
| |	| |	29	-0.008	-0.022	29.287	0.450
| |	| |	30	-0.017	-0.019	29.578	0.487
| |	| |	31	0.007	0.009	29.623	0.537
| |	| |	32	-0.064	-0.058	33.660	0.387
| |	| |	33	0.016	0.016	33.922	0.423
| |	| |	34	-0.053	-0.050	36.726	0.344
| |	| |	35	-0.009	-0.006	36.815	0.385
| |	| |	36	-0.029	-0.030	37.660	0.393

Conditional Covariance

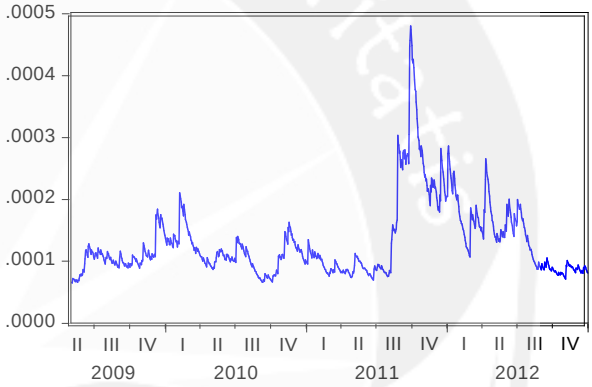
Var(RS)



Cov(RS,RF)



Var(RF)



LAMPIRAN 2

Perhitungan *Out of sample*

ADF *Return Spot out of sample*

Null Hypothesis: RS3 has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.597878	0.0000
Test critical values:	1% level	-3.542097	
	5% level	-2.910019	
	10% level	-2.592645	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RS3)
Method: Least Squares
Date: 10/06/13 Time: 12:34
Sample (adjusted): 1/03/2013 3/28/2013
Included observations: 61 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RS3(-1)	-1.119179	0.130169	-8.597878	0.0000
C	0.000922	0.000973	0.947258	0.3474

R-squared	0.556136	Mean dependent var	-6.27E-05
Adjusted R-squared	0.548613	S.D. dependent var	0.011233
S.E. of regression	0.007547	Akaike info criterion	-6.903109
Sum squared resid	0.003360	Schwarz criterion	-6.833900
Log likelihood	212.5448	F-statistic	73.92350
Durbin-Watson stat	2.006974	Prob(F-statistic)	0.000000

ADF *Futures Return out of sample*

Null Hypothesis: RF3 has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.891777	0.0000
Test critical values:	1% level	-3.542097	
	5% level	-2.910019	
	10% level	-2.592645	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF3)
Method: Least Squares
Date: 10/06/13 Time: 12:35
Sample (adjusted): 1/03/2013 3/28/2013
Included observations: 61 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF3(-1)	-1.021681	0.129462	-7.891777	0.0000
C	0.000962	0.000929	1.036124	0.3044

R-squared	0.513523	Mean dependent var	0.000244
Adjusted R-squared	0.505278	S.D. dependent var	0.010263
S.E. of regression	0.007219	Akaike info criterion	-6.992020
Sum squared resid	0.003075	Schwarz criterion	-6.922811
Log likelihood	215.2566	F-statistic	62.28015
Durbin-Watson stat	1.931437	Prob(F-statistic)	0.000000

Model OLS out of sample

Dependent Variable: RS3
Method: Least Squares
Date: 10/06/13 Time: 12:33
Sample: 1/02/2013 3/28/2013
Included observations: 62

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF3	0.314839	0.127099	2.477127	0.0160

R-squared	0.082157	Mean dependent var	0.000750
Adjusted R-squared	0.082157	S.D. dependent var	0.007493
S.E. of regression	0.007179	Akaike info criterion	-7.019297
Sum squared resid	0.003144	Schwarz criterion	-6.984988
Log likelihood	218.5982	Durbin-Watson stat	2.735253

Estimasi Lag VAR out of sample

VAR Lag Order Selection Criteria
Endogenous variables: RS3 RF3
Exogenous variables: C
Date: 10/09/13 Time: 22:28
Sample: 1/02/2013 3/28/2013
Included observations: 57

Lag	LogL	LR	FPE	AIC	SC
0	412.5278	NA	1.90e-09	-14.40448	-14.33280
1	443.6076	58.88810	7.36e-10	-15.35465	-15.13960
2	458.4569	27.09338	5.03e-10	-15.73533	-15.37690*
3	461.3524	5.079959	5.24e-10	-15.69658	-15.19478
4	466.4217	8.537667	5.06e-10	-15.73409	-15.08892
5	478.5704	19.60843*	3.82e-10*	-16.02001*	-15.23147

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Model

Vector Autoregression Estimates
Date: 10/06/13 Time: 12:36
Sample (adjusted): 1/09/2013 3/28/2013
Included observations: 57 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	RS3	RF3
RS3(-1)	-0.662796	0.613198
	(0.15573)	(0.29079)
	[-4.25612]	[2.10874]
RS3(-2)	-0.911549	-0.390183
	(0.19390)	(0.36206)
	[-4.70119]	[-1.07767]
RS3(-3)	-0.608593	-0.358521
	(0.19583)	(0.36567)
	[-3.10778]	[-0.98045]
RS3(-4)	-0.604321	-0.918408
	(0.16361)	(0.30550)
	[-3.69377]	[-3.00626]
RS3(-5)	-0.154452	-0.077537
	(0.08924)	(0.16663)
	[-1.73080]	[-0.46532]
RF3(-1)	1.008030	-0.039523
	(0.08919)	(0.16654)
	[11.3020]	[-0.23731]
RF3(-2)	0.677413	-0.345946
	(0.17351)	(0.32400)
	[3.90411]	[-1.06774]
RF3(-3)	0.703686	0.602968
	(0.19758)	(0.36894)
	[3.56152]	[1.63433]
RF3(-4)	0.556757	0.469040
	(0.16888)	(0.31535)
	[3.29679]	[1.48738]
RF3(-5)	0.502105	0.628122

	(0.11564)	(0.21593)
	[4.34209]	[2.90895]
C	0.000356	0.000499
	(0.00044)	(0.00081)
	[0.81552]	[0.61327]
R-squared	0.791376	0.396291
Adj. R-squared	0.746023	0.265050
Sum sq. resids	0.000466	0.001625
S.E. equation	0.003183	0.005943
F-statistic	17.44926	3.019566
Log likelihood	252.9847	217.3889
Akaike AIC	-8.490692	-7.241718
Schwarz SC	-8.096419	-6.847444
Mean dependent	0.000572	0.000736
S.D. dependent	0.006315	0.006932
Determinant resid covariance (dof adj.)		2.68E-10
Determinant resid covariance		1.75E-10
Log likelihood		478.5704
Akaike information criterion		-16.02001
Schwarz criterion		-15.23147

Hasil Variance dan Covariance model VAR

Covariance Matrix		
	RS3	RF3
RS3	0.000010	0.000009
RF3	0.000009	0.000035

Hasil perhitungan efektivitas Hedging out of sample VAR model

	Value
σ_s	0.000010
σ_f	0.000035
σ_{sf}	0.000009
VarU	0.000010
VarH	0.000004
HE (*hedging effectiveness*)	0.566312

VECM

Vector Error Correction Estimates
Date: 10/06/13 Time: 12:37
Sample (adjusted): 1/10/2013 3/28/2013
Included observations: 56 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
RS3(-1)	1.000000
RF3(-1)	-0.937808 (0.03549) [-26.4241]
C	-0.000127

Error Correction:	D(RS3)	D(RF3)
CointEq1	-3.589420 (0.90591) [-3.96221]	0.901328 (1.78743) [0.50426]
D(RS3(-1))	1.940068 (0.79747) [2.43278]	-0.098188 (1.57346) [-0.06240]
D(RS3(-2))	0.963868 (0.65229) [1.47767]	-0.311185 (1.28701) [-0.24179]
D(RS3(-3))	0.529345 (0.44588) [1.18718]	-0.136957 (0.87976) [-0.15568]
D(RS3(-4))	0.034017 (0.25326) [0.13432]	-0.586025 (0.49969) [-1.17277]
D(RS3(-5))	0.012800 (0.08917) [0.14355]	-0.096622 (0.17594) [-0.54919]
D(RF3(-1))	-2.274660 (0.82842) [-2.74579]	0.023628 (1.63452) [0.01446]

D(RF3(-2))	-1.590170	-0.466053
	(0.68352)	(1.34864)
	[-2.32643]	[-0.34557]
D(RF3(-3))	-0.829833	0.000786
	(0.51720)	(1.02048)
	[-1.60446]	[0.00077]
D(RF3(-4))	-0.397938	0.028210
	(0.31310)	(0.61777)
	[-1.27096]	[0.04566]
D(RF3(-5))	0.041286	0.352718
	(0.14267)	(0.28151)
	[0.28937]	[1.25297]
C	-0.000172	0.000110
	(0.00044)	(0.00087)
	[-0.38839]	[0.12559]
R-squared	0.890044	0.673464
Adj. R-squared	0.862555	0.591831
Sum sq. resids	0.000462	0.001797
S.E. equation	0.003239	0.006390
F-statistic	32.37808	8.249814
Log likelihood	248.3174	210.2603
Akaike AIC	-8.439906	-7.080724
Schwarz SC	-8.005902	-6.646720
Mean dependent	-2.35E-05	5.70E-05
S.D. dependent	0.008736	0.010002
Determinant resid covariance (dof adj.)		3.03E-10
Determinant resid covariance		1.87E-10
Log likelihood		468.2923
Akaike information criterion		-15.79615
Schwarz criterion		-14.85581

Hasil Variance dan Covariance VECM

Covariance Matrix		
	RS3	RF3
RS3	0.000010	0.000011
RF3	0.000011	0.000041

Hasil perhitungan efektivitas Hedging out of sample VEC model

	Value
σ_s	0.000010
σ_f	0.000041
σ_{sf}	0.000011
VarU	0.000010
VarH	0.000005
HE (*hedging effectiveness*)	0.517974

M-GARCH MODEL

System: UNTITLED
Estimation Method: ARCH Maximum Likelihood (Marquardt)
Covariance specification: Diagonal VECH
Date: 10/06/13 Time: 12:54
Sample: 1/02/2013 3/28/2013
Included observations: 62
Total system (balanced) observations 124
Presample covariance: backcast (parameter =0.7)
Convergence achieved after 61 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	0.000605	0.001160	0.521412	0.6021
C(2)	0.000605	0.001093	0.553183	0.5801
Variance Equation Coefficients				
C(3)	1.05E-05	1.08E-05	0.970466	0.3318
C(4)	6.71E-06	1.22E-05	0.547631	0.5839
C(5)	4.45E-05	4.35E-05	1.024539	0.3056
C(6)	-0.003396	0.074767	-0.045420	0.9638
C(7)	-0.107410	0.187037	-0.574272	0.5658
C(8)	0.226009	0.298664	0.756733	0.4492
C(9)	0.751773	0.224056	3.355296	0.0008
C(10)	0.692759	0.638183	1.085517	0.2777
C(11)	-0.072382	0.826461	-0.087581	0.9302

Log likelihood	444.2450	Schwarz criterion	-13.59825
Avg. log likelihood	3.582621	Hannan-Quinn criter.	-13.82747
Akaike info criterion	-13.97565		

Equation: SS = C(1)

R-squared	-0.000379	Mean dependent var	0.000750
Adjusted R-squared	-0.000379	S.D. dependent var	0.007493
S.E. of regression	0.007495	Sum squared resid	0.003427
Durbin-Watson stat	2.209511		

Equation: FF = C(2)

R-squared	-0.000807	Mean dependent var	0.000807
Adjusted R-squared	-0.000807	S.D. dependent var	0.007186
S.E. of regression	0.007189	Sum squared resid	0.003153
Durbin-Watson stat	2.005836		

Covariance specification: Diagonal VECH
GARCH = M + A1.*RESID(-1)*RESID(-1)' + B1.*GARCH(-1)
M is an indefinite matrix
A1 is an indefinite matrix*
B1 is an indefinite matrix*

Transformed Variance Coefficients

	Coefficient	Std. Error	z-Statistic	Prob.

M(1,1)	1.05E-05	1.08E-05	0.970466	0.3318
M(1,2)	6.71E-06	1.22E-05	0.547631	0.5839
M(2,2)	4.45E-05	4.35E-05	1.024539	0.3056
A1(1,1)	-0.003396	0.074767	-0.045420	0.9638
A1(1,2)	-0.107410	0.187037	-0.574272	0.5658
A1(2,2)	0.226009	0.298664	0.756733	0.4492
B1(1,1)	0.751773	0.224056	3.355296	0.0008
B1(1,2)	0.692759	0.638183	1.085517	0.2777
B1(2,2)	-0.072382	0.826461	-0.087581	0.9302

* Coefficient matrix is not PSD.

Hasil Variance dan Covariance model M-GARCH

Covariance Matrix		
	RSM	RFM
RSM	0.000055	0.000016
RFM	0.000016	0.000051

Hasil perhitungan efektivitas *Hedging Out of sample* M-GARCH model

	Value
h_{sst}	0.000055
h_{fft}	0.000051
h_{sft}	0.000016
VarU	0.000055
VarH	0.000006
HE (*hedging effectiveness*)	0.890984