PERAMALAN SAHAM SYARIAH MENGGUNAKAN MODEL AGARCH DENGAN DISTRIBUSI *SKEWED STUDENT-T*

Skripsi
Untuk memenuhi sebagian persyaratan
mencapai derajat Sarjana S-1
Program Studi Matematika

diajukan oleh
MUHAMMAD SAFI' MULHAN
13610010

Kepada
PROGRAM STUDI MATEMATIKA
FAKULTAS SAINS DAN TEKNOLOGI
UNIVERSITAS ISLAM NEGERI SUNAN KALIJAGA
YOGYAKARTA

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SURAT PERSETUJUAN SKRIPSI/TUGAS AKHIR

Hal : Persetujuan Skripsi/Tugas akhir
Lamp : -

Kepada
Yth. Dekan Fakultas Sains dan Teknologi
UIN Sunan Kalijaga Yogyakarta
di Yogyakarta

Assalamu'alaikum wr. wb.

Setelah membaca, meneliti, memberikan petunjuk dan mengoreksi serta mengadakan perbaikan seperlunya, maka kami selaku pembimbing berpendapat bahwa skripsi Saudara:

Nama : Muhammad Safi' Mulhan
NIM : 13610010
Judul Skripsi : Peramalan Saham Syariah Menggunakan Model AGARCH Dengan Distribusi *Skewed Student-t*

sudah dapat diajukan kembali kepada Program Studi Matematika Fakultas Sains dan Teknologi UIN Sunan Kalijaga Yogyakarta sebagai salah satu syarat untuk memperoleh gelar Sarjana Strata Satu dalam bidang matematika.

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Wassalamu'alaikum wr. wb.

Yogyakarta, 7 November 2017
Pembimbing

M Farhan Qudratuallah, M.Si
NIP. 197790922 200801 1 011

KEMENTERIAN AGAMA
UNIVERSITAS ISLAM NEGERI SUNAN KALIJAGA
FAKULTAS SAINS DAN TEKNOLOGI
Jl. Marsda Adisucipto Telp. (0274) 540971 Fax. (0274) 519739 Yogyakarta 55281

PENGESAHAN TUGAS AKHIR

Nomor : B-3070/Un.02/DST/PP.00.9/11/2017

Tugas Akhir dengan judul : Peramalan Saham Syariah Menggunakan Model AGARCH dengan Distribusi Skewed Student -t

yang dipersiapkan dan disusun oleh:

Nama	: MUHAMMAD SAFI' MULHAN
Nomor Induk Mahasiswa	: 13610010
Telah diujikan pada	: Senin, 20 November 2017
Nilai ujian Tugas Akhir	: A-

dinyatakan telah diterima oleh Fakultas Sains dan Teknologi UIN Sunan Kalijaga Yogyakarta

TIM UJIAN TUGAS AKHIR

Ketua Sidang

Mohammad Farhan Qudratullah, S.Si., M.Si
NIP. 19790922 200801 1 011

Penguji I

Dr. Muhammad Wakhid Musthofa, S.Si., M.Si.
NIP. 19800402 200501 1 003

Penguji II

Epha Diana Supandi, S.Si., M.Sc
NIP. 19750912 200801 2 015

Yogyakarta, 20 November 2017
UIN Sunan Kalijaga
Fakultas Sains dan Teknologi
D E K A N

Dr. Murtono, M.Si.
NIP. 19691212 200003 1 001

SURAT PERNYATAAN KEASLIAN

Yang bertanda tangan dibawah ini:

Nama : Muhammad Safi' Mulhan

NIM : 13610010

Program Studi : Matematika

Fakultas : Sains dan Teknologi

Dengan ini menyatakan bahwa isi skripsi ini tidak terdapat karya yang pernah diajukan untuk memperoleh gelar sarjana di suatu Perguruan Tinggi dan sesungguhnya skripsi ini merupakan hasil pekerjaan penulis sendiri sepanjang pengetahuan penulis, bukan duplikasi atau saduran dari karya orang lain kecuali bagian tertentu yang penulis ambil sebagai bahan acuan. Apabila terbukti pernyataan ini tidak benar, sepenuhnya menjadi tanggung jawab penulis.

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Muhammad Safi' Mulhan

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Regina Amanatin Mujaddidah dan Muhammad Nurussalam Asyarifi

Keluarga Besar "KUMATH", Mahasiswa Matematika angkatan 2013 UIN Sunan Kalijaga Yogyakarta.

Keluarga Besar HIMASAKTI, Himpunan Mahasiswa Santri Alumni Keluarga Tebuireng di Yogyakarta.

Almamater Tercinta Prodi Matematika Fakultas Sains dan Teknologi UIN Sunan Kalijaga Yogyakarta.

MOTTO

"Barang siapa bersungguh-sungguh, sesungguhnya kesungguhannya itu adalah untuk dirinya sendiri, ... "
(Al-Ankabut : 6)

"Kesulitan itu Mendatangkan Kemudahan"
-Kaidah Usul Fiqh-

"Apa yang kau cari sedang mencarimu"
-Jalaluddin Rumi-

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Muhammad Safi' Mulhan
NIM. 13610010

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DAFTAR LAMPIRAN

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R_t : *log return* pada periode *t*

r_t : *simple net return* pada periode *t*

P_t : nilai *asset* pada periode *t*

P_{t-1} : nilai *asset* pada periode *t*-1

$\hat{\phi}$: estimasi kuadrat terkecil

ε_t : nilai kesalahan (residual) pada saat *t*

Y_t : pengamatan runtun waktu ke *t*

α : parameter model AGARCH (p,q)

β : parameter model AGARCH (p,q)

γ : parameter model AGARCH (p,q)

ξ : parameter distribusi *skewed student-t*

υ : derajat kebebasan

σ : simpangan baku

n : banyak data

$\bar{X}$: nilai rata-rata

$SE(\hat{\phi})$: estimasi standar *error*

k : *time lag*

Γ : fungsi gamma

μ : mean

σ^2 : variansi

ABSTRAK

PERAMALAN SAHAM SYARIAH MENGGUNAKAN MODEL AGARCH DENGAN DISTRIBUSI *SKEWED STUDENT-T*

Oleh:

Muhammad Safi' Mulhan
13610010

Dalam kegiatan berinvestasi, seorang *investor* dihadapkan pada dua hal yaitu tingkat pengembalian dan juga resiko yang mungkin timbul akibat adanya ketidakpastian. Keputusan untuk melakukan investasi selalu beriringan dengan probabilitas untung dan rugi yang mana tak seorang pun mampu memprediksi apa yang akan terjadi. Perubahan volatilitas indeks harga saham setiap harinya mengalami perubahan yang tidak konstan dan data saham tidak simetris (asimetris) yang dipengaruhi oleh berbagai faktor. Oleh karena itu, diperlukan alat yang dapat memprediksi harga saham yang akan datang. Dalam ilmu statistika, alat untuk memprediksi kondisi masa yang akan datang berdasarkan data masa lampau disebut *forecasting* (peramalan). Model AGARCH dengan distribusi *Skewed Student-t* merupakan model yang digunakan untuk menganalisis data runtun waktu yang bersifat heterokedastisitas dan asimetris.

Penelitian ini membahas peramalan saham syariah menggunakan model AGARCH dengan distribusi *skewed student-t*. Penelitian ini menggunakan data indeks harga saham harian *Jakarta Islamic Index* (JII) periode 4 Maret 2013 sampai 28 April 2017. Langkah-langkah dalam penelitian ini adalah pengujian kestasioner data, mengidentifikasi model ARIMA, mengestimasi model ARIMA, menguji diagnostik model ARIMA, mendeteksi ada tidaknya unsur heterokedastisitas, mengestimasi model GARCH, menguji diagnostik model GARCH, uji asimetris data, mengestimasi model AGARCH dengan distribusi *skewed student-t*, menguji diagnostik model AGARCH dengan distribusi *skewed student-t*, melakukan peramalan dengan model AGARCH.

Hasil dari penelitian ini menunjukan bahwa model ARIMA(0,0,3)-AGARCH(2,0) adalah model terbaik untuk meramalkan data yang dipilih berdasarkan kriteria pemilihan model terbaik dengan nilai MAPE atau nilai kesalahan rata-rata sebesar 0.1555291%.

Kata Kunci : Peramalan (*forecasting*), *Heterokedasticity*, *Time Series*, ARIMA, AGARCH, *skewed student-t*.

ABSTRACT

SYARIAH STOCK FORECASTING USING AGARCH MODEL WITH SKEWED STUDENT-T DISTRIBUTION

By:

Muhammad Safi' Mulhan
13610010

In an investment activity, an investor is faced with two things that is the rate of return and the risk that may arise due to the uncertainty too. The decision to invest is always in tandem with the probability of profit and loss that no one can predict what will happen. Everyday the Changes in stock price volatility there are changes. There are not constant and asymmetrical stock data are influenced by various factors. Therefore, we need the tools that can predict future stock prices. In the science of statistics, a tool for predicting future conditions based on data in the past is called forecasting. The AGARCH model with Skewed Student-t distribution is a model used to analyze time series data that are heterochedastic and asymmetric.

This research discusses syariah stock forecasting using AGARCH model with skewed student-t distribution. This research uses daily index of Jakarta Islamic Index (JII) stock price period from March 4, 2013 to April 28, 2017. The steps in this research are testing the data stationer, identifying the ARIMA model, estimating the ARIMA model, testing the ARIMA model diagnostics, detecting the presence of heterokedasticity, estimating the GARCH model, testing the GARCH model diagnostic, asymmetric data test, estimating the AGARCH model with skewed student-t distribution, testing the diagnostic of AGARCH model with skewed student-t distribution, forecasting with AGARCH model.

The results of this research show that ARIMA model (0,0,3) -AGARCH (2.0) is the best model to predict selected data based on best model selection criteria with MAPE value or average error value of 0.1555291%.

Keywords: Forecasting, Heterokedasticity, Time Series, ARIMA, AGARCH, skewed student-t.

BAB I

PENDAHULUAN

1.1 Latar Belakang

Investasi adalah komitmen atas sejumlah dana atau sumberdaya lainnya yang dilakukan pada saat ini dengan tujuan memperoleh keuntungan dimasa yang akan datang. Tujuan mencari keuntungan merupakan hal yang membedakan kegiatan investasi dengan kegiatan menabung, investasi untuk perlindungan serta untuk memperoleh rasa aman melalui tindakan berjaga-jaga dengan mencadangkan sejumlah dana. Dalam kegiatan berinvestasi, seorang investor dihadapkan pada dua hal yaitu tingkat pengembalian dan juga resiko yang mungkin timbul akibat adanya ketidakpastian. (Tandelilin, 2010)

Pada pasar modal, para investor dapat memilih investasi berbagai investasi yang ada. Pasar modal adalah pertemuan antara pihak yang memiliki kelebihan dana dengan pihak yang membutuhkan dana dengan cara memperjualbelikan sekuritas atau surat berharga. Sekuritas memiliki berbagai macam bentuk yang secara garis besar dikelompokkan menjadi dua jenis yaitu surat kepemilikan (saham) dan surat hutang (obligasi). Pasar modal syariah adalah pasar modal yang menerapkan prinsip-prinsip syari'ah dalam transaksi ekonomi. Pasar modal syariah menggunakan prinsip, prosedur, asumsi dan aplikasi bersumber dari nilai epistimologi Islam.

Di Dunia Internasional indeks saham Syariah telah berkembang di negara bagian Timur Tengah. Seiring dengan perkembangan ekonomi Islam secara global, indeks syari'ah merupakan alternatif investasi yang aman khususnya bagi kaum muslim yang ingin berinvestasi secara syariah. Di Indonesia yang sebagian besar penduduknya muslim, pada tahun 2000 telah dibuka *Jakarta Islamic Indeks* (JII) sebagai pasar modal yang menggunakan prinsip syariah dan dikhususkan untuk perusahaan-perusahaan dengan prinsip syariah.

Menurut Darmadji dan Hendy (2001), saham adalah tanda bukti penyertaan atau kepemilikan seseorang atau institusi dalam suatu badan usaha atau perusahaan. Dengan menerbitkan saham, memungkinkan perusahaan-perusahaan yang membutuhkan pendanaan jangka panjang untuk menjual kepentingan dalam bisnis saham dengan imbalan uang tunai. Indikator atau cerminan harga saham disebut indeks harga saham. Indeks harga saham merupakan salah satu pedoman bagi investor untuk melakukan investasi di pasar modal, khususnya saham.

Keputusan untuk melakukan investasi selalu beriringan dengan probabilitas untung dan rugi yang mana tak seorang pun mampu memprediksi apa yang akan terjadi. Dalam ilmu statistika, alat untuk memprediksi kondisi masa yang akan datang berdasarkan data masa lampau disebut *forecasting* (peramalan). Peramalan ini bertujuan untuk memperkecil resiko dan faktor-faktor ketidakpastian dalam memprediksi masa depan.

Menurut Makridakis (1999), terdapat dua metode dalam melakukan peramalan diantaranya yaitu analisis *cross-section* atau sebab-akibat (*Casual Method*) merupakan analisis variabel yang dicari dengan variabel bebas atau yang mempengaruhinya, sedangkan analisis runtun waktu (*time series*) dimana analisis antar variabel yang dicari dengan variabel waktu.

Analisis *time series* atau runtun waktu dapat diklarifikasikam menjadi dua yaitu : model univariat dan model multivariat. Model univariat hanya mengamati satu variabel/individu runtun waktu. Sedang model multivariat lebih dari satu variabel/individu runtun waktu. Model *time series* yang paling populer dan banyak digunakan dalam peramalan data *time series* univariat adalah model *Autoregressive Integrated Moving* atau yang dikenal dengan model ARIMA (Makridakis, 1998).

Praktek pemodelan ARIMA pada suatu data ekonomi seringkali memberikan residual dengan varians yang tidak konstan (heterogen). Engle (1982) memperkenalkan model *Autoregressive Conditional Heteroscedasticity* (ARCH) untuk memodelkan inflasi di inggris yang mengandung varians yang tidak konstan. Kemudian model ARCH disempurnakan menjadi *Generalized Autoregressive Conditional Heteroscedasticity* (GARCH) oleh Bolerslev (1986). Metode ini mampu mengatasi heteroskedastisitas dalam deret waktu sehingga nanti model yang diperoleh baik digunakan untuk melakukan peramalan.

Sayangnya, model GARCH sering tidak selalu menangkap secara penuh adanya *thick-tailed property* dari *financial time series* dengan frekuensi yang tinggi. Hal ini secara alamiah digunakan untuk distribusi non normal dengan *excess* kurtosis. Untuk menagkap *skweness* secara lebih baik, pengaplikasian suatu kepadatan asimetrik yang stabil digunakan untuk menangkap *skweness* secara lebih baik (Liu, S. M., dan B.Brorsen, 1995). Suatu distribusi yang dapat digunakan untuk model *skweness* dan *kurtosis* adalah *Skewed Student-t* dari Fernandez, C dan M Steel (1998), diperluas ke dalam kerangka kerja GARCH oleh Lambert, P dan S Laurent (2000). Untuk memecahkan masalah ini, beberapa perluasan non linear dari model GARCH telah diusulkan. Perluasan tersebut adalah model Asimetris GARCH (AGARCH) oleh Peters, J.P (2001).

Dari latar belakang diatas maka peneliti mengambil judul tentang " Peramalan Saham Syariah Menggunakan Model AGARCH dengan Distribusi *Skewed Student-t*".

1.2 Batasan Masalah

Pada penelitian ini terdapat beberapa batasan-batasan yang akan diteliti, batasan-batasan ini digunakan untuk mempermudah penelitian dalam melakukan suatu penelitian, yaitu :

1. Estimasi parameter menggunakan metode *Maximum Likelihood.*
2. Data yang digunakan adalah data Indeks Harga Saham JII (*Jakarta Islamic Indeks*).
3. Menggunakan bantuan *software* E-Views 9 dan Ms.Excel.

1.3 Rumusan Masalah

Berdasarkan uraian di atas, maka masalah yang akan di kaji dalam penelitain ini adalah :

1. Bagaimana langkah-langkah peramalan saham syariah menggunakan model AGARCH dengan Distribusi *Skewed Student-t*?
2. Bagaimana bentuk model AGARCH dengan Distribusi *Skewed Student-t* yang terbaik untuk meramalkan saham pada indeks harga saham syariah JII?
3. Bagaimana hasil peramalan saham syariah JII dengan model AGARCH dengan Distribusi *Skewed Student-t* untuk meramalkan indeks harga saham syariah JII?

1.4 Tujuan Penelitian

Berdasarkan rumusan masalah di atas, maka tujuan skripsi ini adalah :

1. Mengetahui langkah- langkah peramalan saham syariah menggunakan model AGARCH dengan Distribusi *Skewed Student-t*.
2. Mengetahui bentuk model AGARCH dengan Distribusi *Skewed Student-t* yang terbaik untuk meramalkan indeks harga saham syariah JII.
3. Mengetahui hasil peramalan indeks harga saham syariah JII dengan model AGARCH dengan Distribusi *Skewed Student-t*.

1.5 Manfaat Penelitian

Bagi Penulis :

a. Menambah pengetahuan tentang aplikasi matematika khususnya statistika.

b. Menambah wawasan mengenai peramalan saham syariah menggunakan model AGARCH dengan Distribusi *Skewed Student-t*.

Bagi Prodi Matematika :

a. Mengetahui sejauh mana kemampuan mahasiswa dalam menerapkan teori matematika khususnya statistika.

b. Menambah referensi guna meningkatkan proses perkuliahan.

Bagi Investor :

Dapat memberikan informasi atau masukan kepada para investor mengenai gambaran indeks harga saham dalam beberapa waktu kedepan, sehingga dapat dijadikan bahan pertimbangan.

1.6 Tinjauan Pustaka

Tinjuan pustaka yang digunakan oleh peneliti adalah beberapa penelitian yang relevan dengan tema yang diambil peneliti, antara lain :

1. Penelitian Susi Tri Wahyuni (ITS) yang berjudul Peramalan Volatilitas Indeks Harga Saham Menggunakan Model Asimetrik GARCH (*Generalized Autoregressive Conditional Heteroscedasticity*) Dengan Distribusi *Skewed Student-t*. Penelitian ini menggunakan model GARCH

(*Generalized Autoregressive Conditional Heteroscedasticity*) dan menggunakan model Asimetrik GARCH (*Generalized Autoregressive Conditional Heteroscedasticity*) Dengan Distribusi *Skewed Student-t*. Data yang digunakan yaitu data Indeks Harga Saham Gabungan (IHSG) yang dipublikasikan Bursa Efek Jakarta mulai 2 Januari 2001 sampai dengan 29 April 2005.

2. Penelitian Alvan Pratama A.L (UIN) yang berjudul Peramalan Data Runtun Waktu dengan Model ARIMAX-GARCH Dalam Pasar Modal Syari'ah. Penelitian ini menggunakan model ARIMAX-GARCH (*ARIMAX-Generalized Autoregressive Conditional Heteroscedasticity*). Data yang digunakan yaitu data Indeks Harga Saham Harian *Jakarta Islamic Index* (JII) mulai 2 Januari sampai dengan 30 Juni 2014.
3. Penelitian Fitriyatul Hasanah (UIN) yang berjudul Peramalan Data *Time Series* dengan model APARCH (*Asymmetric Power Autoregressive Conditional Heterocedasticity*). Data yang digunakan yaitu data Indeks Harga Saham JII mulai 1 januari 2014 sampai dengan 31 desember 2015.

Pada penelitian yang sekarang memiliki persamaan dan perbedaan baik itu dari model yang akan digunakan maupun objek yang diteliti. Penelitian dari Susi Tri Wahyuni, model yang digunakan sebelumnya sama menggunakan model AGARCH dengan Distribusi *Skewed Student-t* tetapi objek yang digunakan berbeda. Pada penelitian sebelumnya menggunakan objek saham IHSG Bursa Efek Jakarta sedangkan penelitian yang sekarang menggunakan saham Indeks Harga Saham Harian JII. Pada penelitian Alvan Pratama A.L,

objek yang diteliti sebelumnya sama menggunakan saham JII tetapi model yang digunakan berbeda. Pada penelitian sebelumnya menggunakan model ARIMAX-GARCH sedangkan penelitian yang sekarang menggunakan model AGARCH dengan Distribusi *Skewed Student-t*. Sedangkan pada penelitian Fitriyatul Hasanah, objek yang diteliti sebelumnya sama menggunakan saham JII tetapi model yang digunakan berbeda. Pada penelitian sebelumnya menggunakan model APARCH.

Tabel 1.1 Tinjauan Pustaka

No	Nama Peneliti	Metode	Objek
1	Susi Tri Wahyuni. (ITS)	Asimetrik GARCH dengan Distribusi *Skewed Student-t*	Indeks Harga Saham Gabungan (IHSG) Bursa Efek Jakarta
2	Alvan Pratama A.L (UIN)	ARIMAX-GARCH	Indeks Harga Saham Syari'ah JII
3	Fitriyatul Hasanah (UIN)	APARCH	Indeks Harga Saham Syari'ah JII
4	Muhammad Safi' Mulhan (UIN)	AGARCH dengan Distribusi *Skewed Student-t*	Indeks Harga Saham Syari'ah JII

1.7 Sistematika Penulisan

Sistematika penelitian ini disusun untuk memberikan gambaran secara menyeluruh dan mempermudah dalam memahami penelitian mengenai peramalan saham syariah menggunakan model AGARCH dengan Distribusi *Skewed Student-t*. Secara garis besar sistematika penulisannya yaitu :

BAB I PENDAHULUAN

Pada Bab I ini membahas tentang pandahuluan yang meliputi latar belakang, batasan masalah, rumusan masalah, tujuan penelitian, manfaat penelitian, tinjauan pustaka, metode penelitian, dan sistematika penelitian.

BAB II LANDASAN TEORI

Dalam Bab II ini membahas tentang teori-teori yang menunjang pembahasan penelitian ini, yaitu peramalan saham syariah menggunakan model AGARCH dengan Distribusi *Skewed Student-t*.

BAB III METODE PENELITIAN

Dalam Bab III ini membahas tentang proses pelaksanaan penelitian ini, mulai dari jenis dan sumber data, metode pengumpulan data, variabel penelitian, metodologi penelitian, alat pengolah data, dan metode analisis data.

BAB IV PEMBAHASAN

Pada Bab IV ini membahas tentang metode peramalan saham syariah menggunakan model AGARCH dengan Distribusi *Skewed Student-t*.

BAB V STUDI KASUS

Pada Bab V ini membahas tentang penerapan- penerapan model AGARCH dengan Distribusi *Skewed Student-t* untuk meramalkan indeks saham syariah JII dan dan pembahasan hasil penelitian.

BAB VI PENUTUP

Pada Bab VI ini membahas tentang kesimpulan yang dapat diambil dari pembahasan permasalahan yang ada dan saran-saran yang perlu disampaikan untuk penelitian selanjutnya.

BAB VI

PENUTUP

6.1 Kesimpulan

Berdasarkan pada pembahasan yang dikemukakan dalam penelitian ini, maka dapat diambil kesimpulan sebagai berikut :

1. Ada beberapa langkah-langkah dalam melakukan peramalan saham syariah menggunakan model AGARCH dengan Distribusi *Skewed Student-t* yaitu sebagai berikut:
   a. Mengumpulkan data indeks saham JII
   b. Statistik deskriptif
   c. Menguji kestasioner data
   d. Menguji kenormalan data
   e. Menentukan model ARIMA
   f. Menguji efek ARCH
   g. Menentukan model GARCH
   h. Uji Asimetris
   i. Menentukan model AGARCH dengan distribusi *skewed student-t*
   j. Peramalan saham syariah menggunakan model AGARCH untuk periode selanjutnya

2. Bentuk model AGARCH dengan distribusi *Skewed Student-t* yang terbaik yaitu ARIMA(0,0,3)-AGARCH(2,0) sebagai berikut :

   - Model ARIMA(0,0,3)

     $X_t = X_{t-1} + 0.108054\Delta\varepsilon_{t-3}$

   - Model AGARCH(2,0)

     $\sigma_t^2 = 0.271194 + 0.313677(|\varepsilon_{t-1}| - 1.425961\varepsilon_{t-1})^2 +$
     $0.134491(|\varepsilon_{t-2}| - 1.425961\varepsilon_{t-2})^2$

3. Peramalan data runtun waktu dengan model terbaik yaitu model ARIMA(0,0,3)-AGARCH(2,0). Data hasil peramalan menunjukan bahwa nilai indeks harga saham JII untuk periode 3 April 2017 sampai 28 April 2017 telah mendekati nilai yang sama dengan data aktualnya. Dengan demikian, model tersebut dapat digunakan untuk meramalkan indeks harga saham JII dengan nilai MAPE sebesar 0.1555291%.

6.2 Saran

Berdasarkan pengalaman dan pertimbangan dalam studi literatur, saran-saran yang dapat ditulis peneliti adalah :

1. Model yang didapat pada pembahasan tugas akhir ini, peneliti mengharapkan dapat menjadi bahan pertimbangan bagi para investor.
2. Pemodelan AGARCH dengan distribusi *skewed student-t* adalah pemodelan runtun waktu yang bersifat asimetris.

3. Untuk peneliti selanjutnya dapat dilakukan dengan menggunakan model volatilitas asimetris lainnya dan dengan distribusi lainnya, seperti EGARCH, TARCH, GJR dengan distribusi *skewed student-t*.

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Lampiran 1 : Data indeks saham JII

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5/29/2015	698.07
6/1/2015	700.65
6/3/2015	692.4
6/4/2015	685.29
6/5/2015	684.75
6/8/2015	672.87
6/9/2015	655.7
6/10/2015	664.75
6/11/2015	666.6
6/12/2015	665.66
6/15/2015	648.04
6/16/2015	653.03
6/17/2015	660.82
6/18/2015	665.06
6/19/2015	666.82
6/22/2015	661.64
6/23/2015	657.11
6/24/2015	666.37
6/25/2015	659.79
6/26/2015	658.85
6/29/2015	652.82
6/30/2015	656.99
7/1/2015	654.81
7/2/2015	662.42
7/3/2015	670.93
7/6/2015	661.37
7/7/2015	657.72
7/8/2015	653.25
7/9/2015	645.59
7/10/2015	648.74
7/13/2015	654.82
7/14/2015	655.9

7/15/2015	653.65
7/22/2015	658.39
7/23/2015	656.34
7/24/2015	646.94
7/27/2015	632.14
7/28/2015	628.63
7/29/2015	629.1
7/30/2015	628.9
7/31/2015	641.97
8/3/2015	636.99
8/4/2015	634.22
8/5/2015	644.25
8/6/2015	634.64
8/7/2015	631.77
8/10/2015	628.83
8/11/2015	607.75
8/12/2015	585.32
8/13/2015	605.3
8/14/2015	606.41
8/18/2015	597.19
8/19/2015	592.13
8/20/2015	587.99
8/21/2015	572.01
8/24/2015	544.39
8/25/2015	554.87
8/26/2015	553.09
8/27/2015	585.17
8/28/2015	586.09
8/31/2015	598.28
9/1/2015	584.1
9/2/2015	582.66
9/3/2015	590.89
9/4/2015	589.14
9/7/2015	565.33
9/8/2015	567.34
9/9/2015	574.99
9/10/2015	577.06
9/11/2015	584.9
9/14/2015	591.68
9/15/2015	580.28
9/16/2015	577.07
9/17/2015	584.43
9/18/2015	584.84
9/21/2015	583.28

9/22/2015	576.16
9/23/2015	561.53
9/25/2015	557.23
9/28/2015	542
9/29/2015	554.43
9/30/2015	556.09
10/1/2015	563.06
10/2/2015	553.87
10/5/2015	576.34
10/6/2015	596.68
10/7/2015	602.55
10/8/2015	601.15
10/9/2015	615.43
10/12/2015	619.08
10/13/2015	592.98
10/15/2015	599.48
10/16/2015	602.01
10/19/2015	612.11
10/20/2015	612.84
10/21/2015	616.93
10/22/2015	611.34
10/23/2015	620.24
10/26/2015	623.61
10/27/2015	620.94
10/28/2015	610.9
10/29/2015	586.97
10/30/2015	586.1
11/2/2015	593.58
11/3/2015	599.47
11/4/2015	610.47
11/5/2015	605.23
11/6/2015	603.79
11/9/2015	591.37
11/10/2015	582.21
11/11/2015	584.88
11/12/2015	582.48
11/13/2015	587.55
11/16/2015	581.53
11/17/2015	589.3
11/18/2015	593.79
11/19/2015	596.86
11/20/2015	604.54
11/23/2015	595.6
11/24/2015	594.88
11/25/2015	599.28
11/26/2015	601.79
11/27/2015	601.04
11/30/2015	579.8
12/1/2015	598.03
12/2/2015	596.9
12/3/2015	596.57
12/4/2015	592.9
12/7/2015	595.72
12/8/2015	582.21
12/10/2015	578.3
12/11/2015	565.09
12/14/2015	565.63
12/15/2015	573.18
12/16/2015	583.17
12/17/2015	600.52
12/18/2015	588.22
12/21/2015	591.69
12/22/2015	595.6
12/23/2015	593.25
12/28/2015	597.28
12/29/2015	599.44
12/30/2015	603.35
1/4/2016	592.11
1/5/2016	597.26
1/6/2016	612.22
1/7/2016	599.38
1/8/2016	600.48
1/11/2016	586.71
1/12/2016	596.04
1/13/2016	601.86
1/14/2016	594.12
1/15/2016	594.64
1/18/2016	587.5
1/19/2016	592.4
1/20/2016	582.8
1/21/2016	581.78
1/22/2016	590.67
1/25/2016	595.41
1/26/2016	594.95
1/27/2016	605.23
1/28/2016	607.75
1/29/2016	612.75
2/1/2016	611.1

2/2/2016	603.72
2/3/2016	610.23
2/4/2016	621.98
2/5/2016	642.55
2/9/2016	636.13
2/10/2016	634.17
2/11/2016	643.98
2/12/2016	630.49
2/15/2016	633.97
2/16/2016	635.29
2/17/2016	638.29
2/18/2016	641.42
2/19/2016	631.06
2/22/2016	631.76
2/23/2016	623.53
2/24/2016	620.82
2/25/2016	623.93
2/26/2016	636.62
2/29/2016	641.86
3/1/2016	648.92
3/2/2016	660
3/3/2016	657.37
3/4/2016	654.52
3/7/2016	650.56
3/8/2016	648.36
3/10/2016	649.18
3/11/2016	653.01
3/14/2016	665.47
3/15/2016	658.03
3/16/2016	661.67
3/17/2016	668.14
3/18/2016	669.3
3/21/2016	668.26
3/22/2016	664.19
3/23/2016	656.99
3/24/2016	653.18
3/28/2016	646.07
3/29/2016	645
3/30/2016	650.67
3/31/2016	652.69
4/1/2016	657.01
4/4/2016	662.13
4/5/2016	658.55
4/6/2016	660.39

4/7/2016	661.06
4/8/2016	660.43
4/11/2016	650.17
4/12/2016	658.74
4/13/2016	661.89
4/14/2016	654.91
4/15/2016	667.81
4/18/2016	673.35
4/19/2016	679.51
4/20/2016	678.59
4/21/2016	682.56
4/22/2016	683.12
4/25/2016	678.81
4/26/2016	666.42
4/27/2016	663.19
4/28/2016	656.41
4/29/2016	653.26
5/2/2016	645.6
5/3/2016	645.72
5/4/2016	650.48
5/9/2016	640.73
5/10/2016	643.79
5/11/2016	651.07
5/12/2016	648.97
5/13/2016	640.13
5/16/2016	634.32
5/17/2016	636.48
5/18/2016	639.12
5/19/2016	632.16
5/20/2016	632.91
5/23/2016	638.89
5/24/2016	635.26
5/25/2016	648.49
5/26/2016	649.36
5/27/2016	655.65
5/30/2016	653.94
5/31/2016	648.85
6/1/2016	654.67
6/2/2016	653.49
6/3/2016	658
6/6/2016	667.53
6/7/2016	674.03
6/8/2016	669.12
6/9/2016	663.7

6/10/2016	657.7
6/13/2016	652.91
6/14/2016	655.59
6/15/2016	660.36
6/16/2016	657.04
6/17/2016	662.55
6/20/2016	666.91
6/21/2016	668.64
6/22/2016	672.99
6/23/2016	670
6/24/2016	663.94
6/27/2016	665.57
6/28/2016	671.02
6/29/2016	688.85
6/30/2016	694.34
7/1/2016	686.84
7/11/2016	701.66
7/12/2016	703.06
7/13/2016	714.39
7/14/2016	700.16
7/15/2016	704.66
7/18/2016	708.56
7/19/2016	712.44
7/20/2016	717.96
7/21/2016	709.81
7/22/2016	709.44
7/25/2016	719.86
7/26/2016	722.49
7/27/2016	733.73
7/28/2016	740.45
7/29/2016	726.61
8/1/2016	750.98
8/2/2016	744.84
8/3/2016	741.19
8/4/2016	744.54
8/5/2016	749.96
8/8/2016	758.16
8/9/2016	757.25
8/10/2016	754.83
8/11/2016	751.88
8/12/2016	744.16
8/15/2016	731.14
8/16/2016	739.07
8/18/2016	756.73

8/19/2016	742.46
8/22/2016	749.42
8/23/2016	750.37
8/24/2016	746.09
8/25/2016	757.02
8/26/2016	755.72
8/29/2016	741.44
8/30/2016	743.02
8/31/2016	746.87
9/1/2016	737.05
9/2/2016	742.07
9/5/2016	743.66
9/6/2016	748.95
9/7/2016	750.22
9/8/2016	744.87
9/9/2016	730.49
9/13/2016	720.09
9/14/2016	705.66
9/15/2016	729.52
9/16/2016	723.16
9/19/2016	736.45
9/20/2016	734.25
9/21/2016	741.46
9/22/2016	747.07
9/23/2016	748.91
9/26/2016	741.33
9/27/2016	752.5
9/28/2016	752.69
9/29/2016	757.07
9/30/2016	739.69
10/3/2016	756.6
10/4/2016	756.69
10/5/2016	747.01
10/6/2016	743.63
10/7/2016	738.33
10/10/2016	736.63
10/11/2016	740.79
10/12/2016	738.19
10/13/2016	733.88
10/14/2016	742.25
10/17/2016	740.56
10/18/2016	746.06
10/19/2016	741.96
10/20/2016	741.07

10/21/2016	739.42
10/24/2016	742.18
10/25/2016	740.11
10/26/2016	739.84
10/27/2016	742.21
10/28/2016	739.38
10/31/2016	739.91
11/1/2016	737.21
11/2/2016	734.39
11/3/2016	720.67
11/4/2016	724.67
11/7/2016	728.29
11/8/2016	740.9
11/9/2016	730.09
11/10/2016	737.34
11/11/2016	698.77
11/14/2016	680.93
11/15/2016	673.76
11/16/2016	694.27
11/17/2016	693.04
11/18/2016	687.79
11/21/2016	683.48
11/22/2016	684.15
11/23/2016	689.93
11/24/2016	674.4
11/25/2016	677.97
11/28/2016	680.87
11/29/2016	685.62
11/30/2016	682.71
12/1/2016	695.97
12/2/2016	703.4
12/5/2016	708.42
12/6/2016	705.69
12/7/2016	700.74
12/8/2016	706.43
12/9/2016	707.6
12/13/2016	705.69
12/14/2016	697.35
12/15/2016	694.25
12/16/2016	685.81
12/19/2016	679.4
12/20/2016	670.01
12/21/2016	666.57
12/22/2016	655.7

12/23/2016	648.1
12/27/2016	660.96
12/28/2016	680.22
12/29/2016	696.13
12/30/2016	694.13
1/3/2017	691.52
1/4/2017	696.36
1/5/2017	700.44
1/6/2017	703.87
1/9/2017	700.61
1/10/2017	701.11
1/11/2017	696.37
1/12/2017	692.49
1/13/2017	691.27
1/16/2017	688.18
1/17/2017	688.9
1/18/2017	696.12
1/19/2017	697.33
1/20/2017	687.24
1/23/2017	687.73
1/24/2017	694.63
1/25/2017	695.89
1/26/2017	699.37
1/27/2017	696.44
1/30/2017	690.59
1/31/2017	689.32
2/1/2017	696.28
2/2/2017	701.1
2/3/2017	702.44
2/6/2017	705.04
2/7/2017	700.31
2/8/2017	698.84
2/9/2017	698.6
2/10/2017	701.58
2/13/2017	705.13
2/14/2017	698.58
2/16/2017	701.57
2/17/2017	695.54
2/20/2017	694.66
2/21/2017	696.57
2/22/2017	697.56
2/23/2017	698.01
2/24/2017	699.87
2/27/2017	698.02

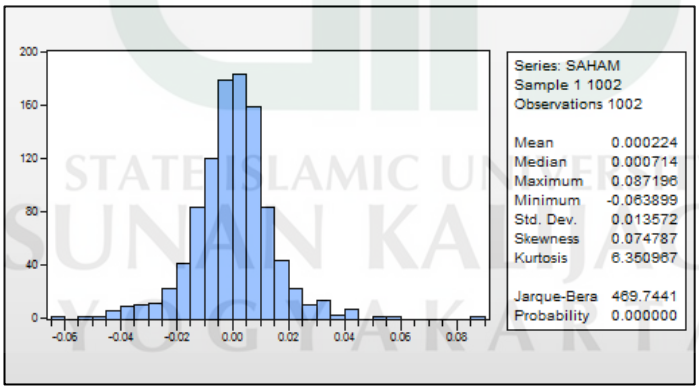
2/28/2017	698.08	3/29/2017	724.27
3/1/2017	694.04	3/30/2017	722.5
3/2/2017	698.02	3/31/2017	718.35
3/3/2017	696.57	4/3/2017	726.59
3/6/2017	705.44	4/4/2017	735.07
3/7/2017	704.36	4/5/2017	734.74
3/8/2017	698.66	4/6/2017	729.4
3/9/2017	699.25	4/7/2017	723.82
3/10/2017	695	4/10/2017	721.06
3/13/2017	697.27	4/11/2017	720.43
3/14/2017	700.22	4/12/2017	726.57
3/15/2017	698.33	4/13/2017	721.7
3/16/2017	717.57	4/17/2017	713.85
3/17/2017	718.88	4/18/2017	717.37
3/20/2017	717.3	4/20/2017	718.42
3/21/2017	717.68	4/21/2017	739.8
3/22/2017	714.85	4/25/2017	740.17
3/23/2017	715.36	4/26/2017	744.76
3/24/2017	716.14	4/27/2017	744.21
3/27/2017	712.58	4/28/2017	738.19

Lampiran 2 : Deskriptif, Uji Normalitas, dan Uji Stasioner Data

1. Deskriptif data indeks saham JII

	SAHAM
Mean	0.000224
Median	0.000714
Maximum	0.087196
Minimum	-0.063899
Std. Dev.	0.013572
Skewness	0.074787
Kurtosis	6.350967
Jarque-Bera	469.7441
Probability	0.000000
Sum	0.224232
Sum Sq. Dev.	0.184372
Observations	1002

2. Uji Normalitas indeks saham JII



3. Uji Stasioner dengan Uji akar unit

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-22.05691	0.0000
Test critical values:	1% level	-3.436676	
	5% level	-2.864222	
	10% level	-2.568250	

Lampiran 3 : Estimasi Model ARIMA

1. ARIMA (1,0,0) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:32
Sample: 1 1002
Included observations: 1002
Convergence achieved after 12 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000224	0.000440	0.508156	0.6115
AR(1)	0.014906	0.022014	0.677095	0.4985
SIGMASQ	0.000184	5.03E-06	36.59512	0.0000

R-squared	0.000223	Mean dependent var	0.000224
Adjusted R-squared	-0.001779	S.D. dependent var	0.013572
S.E. of regression	0.013584	Akaike info criterion	-5.756908
Sum squared resid	0.184331	Schwarz criterion	-5.742208
Log likelihood	2887.211	Hannan-Quinn criter.	-5.751322
F-statistic	0.111184	Durbin-Watson stat	1.997762
Prob(F-statistic)	0.894785		

Inverted AR Roots	.01

2. ARIMA (1,0,0) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:31
Sample: 1 1002
Included observations: 1002
Convergence achieved after 9 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(1)	0.015183	0.021797	0.696584	0.4862
SIGMASQ	0.000184	5.02E-06	36.62885	0.0000

R-squared	-0.000041	Mean dependent var	0.000224
Adjusted R-squared	-0.001041	S.D. dependent var	0.013572
S.E. of regression	0.013579	Akaike info criterion	-5.758640
Sum squared resid	0.184380	Schwarz criterion	-5.748840
Log likelihood	2887.079	Hannan-Quinn criter.	-5.754916
Durbin-Watson stat	1.997756		

Inverted AR Roots	.02

3. ARIMA (2,0,0) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:33
Sample: 1 1002
Included observations: 1002
Convergence achieved after 8 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000224	0.000410	0.546538	0.5848
AR(2)	-0.061202	0.025089	-2.439411	0.0149
SIGMASQ	0.000183	5.03E-06	36.45952	0.0000

R-squared	0.003759	Mean dependent var	0.000224
Adjusted R-squared	0.001765	S.D. dependent var	0.013572
S.E. of regression	0.013560	Akaike info criterion	-5.760444
Sum squared resid	0.183679	Schwarz criterion	-5.745745
Log likelihood	2888.983	Hannan-Quinn criter.	-5.754858
F-statistic	1.884754	Durbin-Watson stat	1.986825
Prob(F-statistic)	0.152406		

Inverted AR Roots	-.00+.25i	-.00-.25i

4. ARIMA (2,0,0) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:32
Sample: 1 1002
Included observations: 1002
Convergence achieved after 8 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(2)	-0.060905	0.024701	-2.465675	0.0138
SIGMASQ	0.000183	5.03E-06	36.45177	0.0000

R-squared	0.003452	Mean dependent var	0.000224
Adjusted R-squared	0.002455	S.D. dependent var	0.013572
S.E. of regression	0.013555	Akaike info criterion	-5.762132
Sum squared resid	0.183736	Schwarz criterion	-5.752332
Log likelihood	2888.828	Hannan-Quinn criter.	-5.758408
Durbin-Watson stat	1.986133		

Inverted AR Roots	-.00+.25i	-.00-.25i

5. ARIMA (3,0,0) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:35
Sample: 1 1002
Included observations: 1002
Convergence achieved after 12 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000221	0.000371	0.597266	0.5505
AR(3)	-0.154985	0.023583	-6.571933	0.0000
SIGMASQ	0.000180	5.22E-06	34.42412	0.0000

R-squared	0.024103	Mean dependent var	0.000224
Adjusted R-squared	0.022149	S.D. dependent var	0.013572
S.E. of regression	0.013420	Akaike info criterion	-5.781011
Sum squared resid	0.179929	Schwarz criterion	-5.766311
Log likelihood	2899.286	Hannan-Quinn criter.	-5.775424
F-statistic	12.33658	Durbin-Watson stat	2.002135
Prob(F-statistic)	0.000005		

Inverted AR Roots	.27+.47i	.27-.47i	-.54

6. ARIMA (3,0,0) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:34
Sample: 1 1002
Included observations: 1002
Convergence achieved after 11 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(3)	-0.154701	0.023358	-6.623160	0.0000
SIGMASQ	0.000180	5.22E-06	34.41272	0.0000

R-squared	0.023747	Mean dependent var	0.000224
Adjusted R-squared	0.022771	S.D. dependent var	0.013572
S.E. of regression	0.013416	Akaike info criterion	-5.782643
Sum squared resid	0.179994	Schwarz criterion	-5.772843
Log likelihood	2899.104	Hannan-Quinn criter.	-5.778919
Durbin-Watson stat	2.001341		

Inverted AR Roots	.27-.46i	.27+.46i	-.54

7. ARIMA (0,0,1) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:37
Sample: 1 1002
Included observations: 1002
Convergence achieved after 26 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000224	0.000441	0.507599	0.6118
MA(1)	0.016843	0.022130	0.761058	0.4468
SIGMASQ	0.000184	5.03E-06	36.59552	0.0000

R-squared	0.000252	Mean dependent var	0.000224
Adjusted R-squared	-0.001749	S.D. dependent var	0.013572
S.E. of regression	0.013583	Akaike info criterion	-5.756938
Sum squared resid	0.184326	Schwarz criterion	-5.742238
Log likelihood	2887.226	Hannan-Quinn criter.	-5.751351
F-statistic	0.126018	Durbin-Watson stat	2.001484
Prob(F-statistic)	0.881613		

Inverted MA Roots	-.02

8. ARIMA (0,0,1) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 10:13
Sample: 1 1002
Included observations: 1002
Convergence achieved after 25 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MA(1)	0.017143	0.021926	0.781851	0.4345
SIGMASQ	0.000184	5.02E-06	36.63042	0.0000

R-squared	-0.000011	Mean dependent var	0.000224
Adjusted R-squared	-0.001011	S.D. dependent var	0.013572
S.E. of regression	0.013578	Akaike info criterion	-5.758671
Sum squared resid	0.184374	Schwarz criterion	-5.748871
Log likelihood	2887.094	Hannan-Quinn criter.	-5.754947
Durbin-Watson stat	2.001524		

Inverted MA Roots	-.02

9. ARIMA (0,0,2) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:38
Sample: 1 1002
Included observations: 1002
Convergence achieved after 16 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000224	0.000406	0.552036	0.5810
MA(2)	-0.067902	0.025281	-2.685858	0.0074
SIGMASQ	0.000183	5.04E-06	36.36330	0.0000

R-squared	0.004165	Mean dependent var	0.000224
Adjusted R-squared	0.002171	S.D. dependent var	0.013572
S.E. of regression	0.013557	Akaike info criterion	-5.760850
Sum squared resid	0.183605	Schwarz criterion	-5.746150
Log likelihood	2889.186	Hannan-Quinn criter.	-5.755264
F-statistic	2.089105	Durbin-Watson stat	1.990117
Prob(F-statistic)	0.124338		

Inverted MA Roots	.26	-.26

10. ARIMA (0,0,2) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:37
Sample: 1 1002
Included observations: 1002
Convergence achieved after 14 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MA(2)	-0.067525	0.024878	-2.714252	0.0068
SIGMASQ	0.000183	5.04E-06	36.35094	0.0000

R-squared	0.003851	Mean dependent var	0.000224
Adjusted R-squared	0.002855	S.D. dependent var	0.013572
S.E. of regression	0.013552	Akaike info criterion	-5.762531
Sum squared resid	0.183662	Schwarz criterion	-5.752731
Log likelihood	2889.028	Hannan-Quinn criter.	-5.758807
Durbin-Watson stat	1.989372		

Inverted MA Roots	.26	-.26

11. ARIMA (0,0,3) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:46
Sample: 1 1002
Included observations: 1002
Convergence achieved after 16 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000220	0.000360	0.612651	0.5402
MA(3)	-0.160645	0.023959	-6.704877	0.0000
SIGMASQ	0.000179	5.22E-06	34.38209	0.0000

R-squared	0.025176	Mean dependent var	0.000224
Adjusted R-squared	0.023224	S.D. dependent var	0.013572
S.E. of regression	0.013413	Akaike info criterion	-5.782106
Sum squared resid	0.179731	Schwarz criterion	-5.767406
Log likelihood	2899.835	Hannan-Quinn criter.	-5.776519
F-statistic	12.90011	Durbin-Watson stat	2.002936
Prob(F-statistic)	0.000003		

Inverted MA Roots	.54	-.27-.47i	-.27+.47i

12. ARIMA (0,0,3) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/22/17 Time: 11:16
Sample: 1 1002
Included observations: 1002
Convergence achieved after 14 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MA(3)	-0.160249	0.023728	-6.753620	0.0000
SIGMASQ	0.000179	5.22E-06	34.37014	0.0000

R-squared	0.024802	Mean dependent var	0.000224
Adjusted R-squared	0.023827	S.D. dependent var	0.013572
S.E. of regression	0.013409	Akaike info criterion	-5.783718
Sum squared resid	0.179800	Schwarz criterion	-5.773918
Log likelihood	2899.643	Hannan-Quinn criter.	-5.779994
Durbin-Watson stat	2.002078		

Inverted MA Roots	.54	-.27-.47i	-.27+.47i

13. ARIMA (1,0,1) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:47
Sample: 1 1002
Included observations: 1002
Convergence achieved after 35 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000216	0.000294	0.734794	0.4626
AR(1)	0.808422	0.061959	13.04770	0.0000
MA(1)	-0.877719	0.051340	-17.09604	0.0000
SIGMASQ	0.000181	5.13E-06	35.35374	0.0000

R-squared	0.013730	Mean dependent var	0.000224
Adjusted R-squared	0.010765	S.D. dependent var	0.013572
S.E. of regression	0.013498	Akaike info criterion	-5.768456
Sum squared resid	0.181841	Schwarz criterion	-5.748857
Log likelihood	2893.997	Hannan-Quinn criter.	-5.761008
F-statistic	4.631144	Durbin-Watson stat	1.864922
Prob(F-statistic)	0.003184		

Inverted AR Roots	.81
Inverted MA Roots	.88

14. ARIMA (1,0,1) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:47
Sample: 1 1002
Included observations: 1002
Convergence achieved after 37 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(1)	0.806628	0.063524	12.69804	0.0000
MA(1)	-0.875336	0.052641	-16.62830	0.0000
SIGMASQ	0.000182	5.13E-06	35.39564	0.0000

R-squared	0.013116	Mean dependent var	0.000224
Adjusted R-squared	0.011140	S.D. dependent var	0.013572
S.E. of regression	0.013496	Akaike info criterion	-5.769832
Sum squared resid	0.181954	Schwarz criterion	-5.755132
Log likelihood	2893.686	Hannan-Quinn criter.	-5.764246
Durbin-Watson stat	1.864874		

Inverted AR Roots	.81
Inverted MA Roots	.88

15. ARIMA (1,0,2) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:51
Sample: 1 1002
Included observations: 1002
Convergence achieved after 28 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000224	0.000412	0.543565	0.5869
AR(1)	0.004913	0.022124	0.222064	0.8243
MA(2)	-0.067035	0.025446	-2.634420	0.0086
SIGMASQ	0.000183	5.04E-06	36.36729	0.0000

R-squared	0.004188	Mean dependent var	0.000224
Adjusted R-squared	0.001195	S.D. dependent var	0.013572
S.E. of regression	0.013563	Akaike info criterion	-5.758878
Sum squared resid	0.183600	Schwarz criterion	-5.739278
Log likelihood	2889.198	Hannan-Quinn criter.	-5.751429
F-statistic	1.399111	Durbin-Watson stat	1.999684
Prob(F-statistic)	0.241602		

Inverted AR Roots	.00	
Inverted MA Roots	.26	-.26

16. ARIMA (1,0,2) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:51
Sample: 1 1002
Included observations: 1002
Convergence achieved after 25 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(1)	0.005304	0.021931	0.241868	0.8089
MA(2)	-0.066594	0.025118	-2.651238	0.0081
SIGMASQ	0.000183	5.04E-06	36.35697	0.0000

R-squared	0.003878	Mean dependent var	0.000224
Adjusted R-squared	0.001884	S.D. dependent var	0.013572
S.E. of regression	0.013559	Akaike info criterion	-5.760562
Sum squared resid	0.183657	Schwarz criterion	-5.745862
Log likelihood	2889.042	Hannan-Quinn criter.	-5.754976
Durbin-Watson stat	1.999703		

Inverted AR Roots	.01	
Inverted MA Roots	.26	-.26

17. ARIMA (1,0,3) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:53
Sample: 1 1002
Included observations: 1002
Convergence achieved after 22 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000220	0.000364	0.605206	0.5452
AR(1)	-0.001668	0.022585	-0.073852	0.9411
MA(3)	-0.160816	0.023958	-6.712506	0.0000
SIGMASQ	0.000179	5.22E-06	34.38108	0.0000

R-squared	0.025179	Mean dependent var	0.000224
Adjusted R-squared	0.022248	S.D. dependent var	0.013572
S.E. of regression	0.013420	Akaike info criterion	-5.780112
Sum squared resid	0.179730	Schwarz criterion	-5.760513
Log likelihood	2899.836	Hannan-Quinn criter.	-5.772664
F-statistic	8.592462	Durbin-Watson stat	1.999847
Prob(F-statistic)	0.000012		

Inverted AR Roots	-.00		
Inverted MA Roots	.54	-.27-.47i	-.27+.47i

18. ARIMA (1,0,3) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:52
Sample: 1 1002
Included observations: 1002
Convergence achieved after 21 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(1)	-0.001226	0.022306	-0.054957	0.9562
MA(3)	-0.160373	0.023740	-6.755464	0.0000
SIGMASQ	0.000179	5.22E-06	34.36880	0.0000

R-squared	0.024803	Mean dependent var	0.000224
Adjusted R-squared	0.022851	S.D. dependent var	0.013572
S.E. of regression	0.013416	Akaike info criterion	-5.781724
Sum squared resid	0.179799	Schwarz criterion	-5.767024
Log likelihood	2899.644	Hannan-Quinn criter.	-5.776137
Durbin-Watson stat	1.999806		

Inverted AR Roots	-.00		
Inverted MA Roots	.54	-.27-.47i	-.27+.47i

19. ARIMA (2,0,1) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:54
Sample: 1 1002
Included observations: 1002
Convergence achieved after 26 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000224	0.000417	0.537671	0.5909
AR(2)	-0.060253	0.025293	-2.382201	0.0174
MA(1)	0.006575	0.022200	0.296175	0.7672
SIGMASQ	0.000183	5.03E-06	36.46228	0.0000

R-squared	0.003801	Mean dependent var	0.000224
Adjusted R-squared	0.000806	S.D. dependent var	0.013572
S.E. of regression	0.013566	Akaike info criterion	-5.758491
Sum squared resid	0.183672	Schwarz criterion	-5.738891
Log likelihood	2889.004	Hannan-Quinn criter.	-5.751042
F-statistic	1.269271	Durbin-Watson stat	1.999667
Prob(F-statistic)	0.283599		

Inverted AR Roots	-.00+.25i	-.00-.25i
Inverted MA Roots	-.01	

20. ARIMA (2,0,1) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:54
Sample: 1 1002
Included observations: 1002
Convergence achieved after 25 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(2)	-0.059905	0.024983	-2.397843	0.0167
MA(1)	0.006939	0.022019	0.315122	0.7527
SIGMASQ	0.000183	5.03E-06	36.45695	0.0000

R-squared	0.003498	Mean dependent var	0.000224
Adjusted R-squared	0.001503	S.D. dependent var	0.013572
S.E. of regression	0.013561	Akaike info criterion	-5.760183
Sum squared resid	0.183727	Schwarz criterion	-5.745483
Log likelihood	2888.852	Hannan-Quinn criter.	-5.754596
Durbin-Watson stat	1.999686		

Inverted AR Roots	-.00+.24i	-.00-.24i
Inverted MA Roots	-.01	

21. ARIMA (2,0,2) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:55
Sample: 1 1002
Included observations: 1002
Convergence achieved after 22 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000220	0.000351	0.626550	0.5311
AR(2)	0.667206	0.141279	4.722623	0.0000
MA(2)	-0.737895	0.126737	-5.822256	0.0000
SIGMASQ	0.000182	5.26E-06	34.64823	0.0000

R-squared	0.008971	Mean dependent var	0.000224
Adjusted R-squared	0.005992	S.D. dependent var	0.013572
S.E. of regression	0.013531	Akaike info criterion	-5.763662
Sum squared resid	0.182718	Schwarz criterion	-5.744062
Log likelihood	2891.595	Hannan-Quinn criter.	-5.756213
F-statistic	3.011335	Durbin-Watson stat	2.002053
Prob(F-statistic)	0.029319		

Inverted AR Roots	.82	-.82
Inverted MA Roots	.86	-.86

22. ARIMA (2,0,2) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:55
Sample: 1 1002
Included observations: 1002
Convergence achieved after 21 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(2)	0.664834	0.143079	4.646617	0.0000
MA(2)	-0.735124	0.128347	-5.727630	0.0000
SIGMASQ	0.000182	5.27E-06	34.64745	0.0000

R-squared	0.008550	Mean dependent var	0.000224
Adjusted R-squared	0.006565	S.D. dependent var	0.013572
S.E. of regression	0.013527	Akaike info criterion	-5.765234
Sum squared resid	0.182796	Schwarz criterion	-5.750534
Log likelihood	2891.382	Hannan-Quinn criter.	-5.759648
Durbin-Watson stat	2.000955		

Inverted AR Roots	.82	-.82
Inverted MA Roots	.86	-.86

23. ARIMA (2,0,3) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:56
Sample: 1 1002
Included observations: 1002
Convergence achieved after 16 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000220	0.000343	0.641558	0.5213
AR(2)	-0.062539	0.025605	-2.442474	0.0148
MA(3)	-0.161951	0.023637	-6.851582	0.0000
SIGMASQ	0.000179	5.20E-06	34.36533	0.0000

R-squared	0.029001	Mean dependent var	0.000224
Adjusted R-squared	0.026083	S.D. dependent var	0.013572
S.E. of regression	0.013393	Akaike info criterion	-5.784033
Sum squared resid	0.179025	Schwarz criterion	-5.764433
Log likelihood	2901.800	Hannan-Quinn criter.	-5.776584
F-statistic	9.935938	Durbin-Watson stat	2.003312
Prob(F-statistic)	0.000002		

Inverted AR Roots	-.00+.25i	-.00-.25i	
Inverted MA Roots	.55	-.27+.47i	-.27-.47i

24. ARIMA (2,0,3) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:56
Sample: 1 1002
Included observations: 1002
Convergence achieved after 18 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(2)	-0.062120	0.025229	-2.462213	0.0140
MA(3)	-0.161490	0.023430	-6.892541	0.0000
SIGMASQ	0.000179	5.20E-06	34.37762	0.0000

R-squared	0.028578	Mean dependent var	0.000224
Adjusted R-squared	0.026633	S.D. dependent var	0.013572
S.E. of regression	0.013390	Akaike info criterion	-5.785593
Sum squared resid	0.179103	Schwarz criterion	-5.770893
Log likelihood	2901.582	Hannan-Quinn criter.	-5.780007
Durbin-Watson stat	2.002387		

Inverted AR Roots	-.00+.25i	-.00-.25i	
Inverted MA Roots	.54	-.27+.47i	-.27-.47i

25. ARIMA (3,0,1) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:57
Sample: 1 1002
Included observations: 1002
Convergence achieved after 21 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000221	0.000375	0.590109	0.5553
AR(3)	-0.155133	0.023592	-6.575764	0.0000
MA(1)	-0.001447	0.022592	-0.064049	0.9489
SIGMASQ	0.000180	5.22E-06	34.42234	0.0000

R-squared	0.024104	Mean dependent var	0.000224
Adjusted R-squared	0.021171	S.D. dependent var	0.013572
S.E. of regression	0.013427	Akaike info criterion	-5.779017
Sum squared resid	0.179928	Schwarz criterion	-5.759417
Log likelihood	2899.287	Hannan-Quinn criter.	-5.771568
F-statistic	8.216824	Durbin-Watson stat	1.999449
Prob(F-statistic)	0.000021		

Inverted AR Roots	.27+.47i	.27-.47i	-.54
Inverted MA Roots	.00		

26. ARIMA (3,0,1) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:57
Sample: 1 1002
Included observations: 1002
Convergence achieved after 20 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(3)	-0.154800	0.023387	-6.619156	0.0000
MA(1)	-0.000980	0.022324	-0.043898	0.9650
SIGMASQ	0.000180	5.22E-06	34.41069	0.0000

R-squared	0.023748	Mean dependent var	0.000224
Adjusted R-squared	0.021794	S.D. dependent var	0.013572
S.E. of regression	0.013423	Akaike info criterion	-5.780648
Sum squared resid	0.179994	Schwarz criterion	-5.765948
Log likelihood	2899.105	Hannan-Quinn criter.	-5.775062
Durbin-Watson stat	1.999521		

Inverted AR Roots	.27+.47i	.27-.47i	-.54
Inverted MA Roots	.00		

27. ARIMA (3,0,2) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:58
Sample: 1 1002
Included observations: 1002
Convergence achieved after 14 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000221	0.000351	0.630959	0.5282
AR(3)	-0.154622	0.023474	-6.586825	0.0000
MA(2)	-0.066773	0.025817	-2.586359	0.0098
SIGMASQ	0.000179	5.20E-06	34.39479	0.0000

R-squared	0.028048	Mean dependent var	0.000224
Adjusted R-squared	0.025126	S.D. dependent var	0.013572
S.E. of regression	0.013400	Akaike info criterion	-5.783057
Sum squared resid	0.179201	Schwarz criterion	-5.763457
Log likelihood	2901.312	Hannan-Quinn criter.	-5.775608
F-statistic	9.599832	Durbin-Watson stat	2.003306
Prob(F-statistic)	0.000003		

Inverted AR Roots	.27-.46i	.27+.46i	-.54
Inverted MA Roots	.26	-.26	

28. ARIMA (3,0,2) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:58
Sample: 1 1002
Included observations: 1002
Convergence achieved after 18 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(3)	-0.154302	0.023298	-6.622877	0.0000
MA(2)	-0.066288	0.025485	-2.601035	0.0094
SIGMASQ	0.000179	5.20E-06	34.40561	0.0000

R-squared	0.027641	Mean dependent var	0.000224
Adjusted R-squared	0.025694	S.D. dependent var	0.013572
S.E. of regression	0.013396	Akaike info criterion	-5.784635
Sum squared resid	0.179276	Schwarz criterion	-5.769935
Log likelihood	2901.102	Hannan-Quinn criter.	-5.779048
Durbin-Watson stat	2.002425		

Inverted AR Roots	.27+.46i	.27-.46i	-.54
Inverted MA Roots	.26	-.26	

29. ARIMA (3,0,3) Dengan Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 10:00
Sample: 1 1002
Included observations: 1002
Convergence achieved after 17 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000220	0.000359	0.613057	0.5400
AR(3)	0.005822	0.157325	0.037009	0.9705
MA(3)	-0.166235	0.156533	-1.061980	0.2885
SIGMASQ	0.000179	5.23E-06	34.31634	0.0000

R-squared	0.025177	Mean dependent var	0.000224
Adjusted R-squared	0.022247	S.D. dependent var	0.013572
S.E. of regression	0.013420	Akaike info criterion	-5.780111
Sum squared resid	0.179730	Schwarz criterion	-5.760511
Log likelihood	2899.836	Hannan-Quinn criter.	-5.772662
F-statistic	8.591902	Durbin-Watson stat	2.002896
Prob(F-statistic)	0.000012		

Inverted AR Roots	.18	-.09-.16i	-.09+.16i
Inverted MA Roots	.55	-.27-.48i	-.27+.48i

30. ARIMA (3,0,3) Tanpa Konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/21/17 Time: 09:59
Sample: 1 1002
Included observations: 1002
Convergence achieved after 16 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(3)	0.004695	0.158035	0.029709	0.9763
MA(3)	-0.164757	0.157304	-1.047378	0.2952
SIGMASQ	0.000179	5.23E-06	34.30698	0.0000

R-squared	0.024803	Mean dependent var	0.000224
Adjusted R-squared	0.022850	S.D. dependent var	0.013572
S.E. of regression	0.013416	Akaike info criterion	-5.781723
Sum squared resid	0.179800	Schwarz criterion	-5.767023
Log likelihood	2899.643	Hannan-Quinn criter.	-5.776137
Durbin-Watson stat	2.002045		

Inverted AR Roots	.17	-.08-.15i	-.08+.15i
Inverted MA Roots	.55	-.27+.47i	-.27-.47i

Lampiran 4 : Uji ARCH-LM Model ARIMA Terbaik

- Model ARIMA (0,0,3) tanpa konstanta

Dependent Variable: SAHAM
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 07/22/17 Time: 11:16
Sample: 1 1002
Included observations: 1002
Convergence achieved after 14 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MA(3)	-0.160249	0.023728	-6.753620	0.0000
SIGMASQ	0.000179	5.22E-06	34.37014	0.0000

R-squared	0.024802	Mean dependent var	0.000224
Adjusted R-squared	0.023827	S.D. dependent var	0.013572
S.E. of regression	0.013409	Akaike info criterion	-5.783718
Sum squared resid	0.179800	Schwarz criterion	-5.773918
Log likelihood	2899.643	Hannan-Quinn criter.	-5.779994
Durbin-Watson stat	2.002078		

Inverted MA Roots	.54	-.27-.47i	-.27+.47i

- Uji efek ARCH pada model ARIMA (0,0,3)

F-statistic	43.06806	Prob. F(1,999)	0.0000
Obs*R-squared	41.37074	Prob. Chi-Square(1)	0.0000

Lampiran 5 : Estimasi Model GARCH

1. GARCH (1,0)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:35
Sample: 1 1002
Included observations: 1002
Failure to improve likelihood (non-zero gradients) after 21 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-36419.37	3.83E+08	-9.51E-05	0.9999
	Variance Equation			
C	5.08E-10	2.43E-05	2.09E-05	1.0000
RESID(-1)^2	0.171428	11798.10	1.45E-05	1.0000
T-DIST. DOF	4.716312	356986.8	1.32E-05	1.0000

R-squared	1.000000	Mean dependent var	0.000224
Adjusted R-squared	1.000000	S.D. dependent var	0.013572
S.E. of regression	3.73E-07	Akaike info criterion	-20.00100
Sum squared resid	1.39E-10	Schwarz criterion	-19.98140
Log likelihood	10024.50	Hannan-Quinn criter.	-19.99355
Durbin-Watson stat	1.969264		

Inverted MA Roots	33.15	-16.57+2...	-16.57-28.71i
	Estimated MA process is noninvertible		

2. GARCH (2,0)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:38
Sample: 1 1002
Included observations: 1002
Convergence achieved after 19 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*RESID(-2)^2

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.101323	0.027448	-3.691477	0.0002
	Variance Equation			
C	0.000116	1.24E-05	9.355636	0.0000
RESID(-1)^2	0.264772	0.071943	3.680305	0.0002
RESID(-2)^2	0.129834	0.054391	2.387034	0.0170
T-DIST. DOF	5.116985	0.914639	5.594540	0.0000

R-squared	0.021308	Mean dependent var	0.000224
Adjusted R-squared	0.021308	S.D. dependent var	0.013572
S.E. of regression	0.013426	Akaike info criterion	-5.932288
Sum squared resid	0.180444	Schwarz criterion	-5.907788
Log likelihood	2977.076	Hannan-Quinn criter.	-5.922977
Durbin-Watson stat	1.989821		

Inverted MA Roots	.47	-.23+.40i	-.23-.40i

3. GARCH (3,0)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:38
Sample: 1 1002
Included observations: 1002
Convergence achieved after 23 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*RESID(-2)^2 + C(5)*RESID(-3)^2

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.091705	0.032508	-2.820980	0.0048
Variance Equation				
C	0.000101	1.15E-05	8.760816	0.0000
RESID(-1)^2	0.230412	0.064912	3.549633	0.0004
RESID(-2)^2	0.099772	0.049359	2.021349	0.0432
RESID(-3)^2	0.129788	0.045179	2.872775	0.0041
T-DIST. DOF	5.710283	1.173663	4.865352	0.0000

R-squared	0.020098	Mean dependent var	0.000224
Adjusted R-squared	0.020098	S.D. dependent var	0.013572
S.E. of regression	0.013435	Akaike info criterion	-5.941032
Sum squared resid	0.180667	Schwarz criterion	-5.911632
Log likelihood	2982.457	Hannan-Quinn criter.	-5.929859
Durbin-Watson stat	1.987851		

Inverted MA Roots	.45	-.23+.39i	-.23-.39i

4. GARCH (0,1)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:24
Sample: 1 1002
Included observations: 1002
Convergence achieved after 40 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.112307	0.026862	-4.180876	0.0000
Variance Equation				
C	2.41E-05	4.27E-05	0.563901	0.5728
GARCH(-1)	0.872845	0.225011	3.879122	0.0001
T-DIST. DOF	4.185229	0.664436	6.298920	0.0000

R-squared	0.022473	Mean dependent var	0.000224
Adjusted R-squared	0.022473	S.D. dependent var	0.013572
S.E. of regression	0.013418	Akaike info criterion	-5.879928
Sum squared resid	0.180229	Schwarz criterion	-5.860328
Log likelihood	2949.844	Hannan-Quinn criter.	-5.872480
Durbin-Watson stat	1.992079		

Inverted MA Roots	.48	-.24-.42i	-.24+.42i

5. GARCH (0,2)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:36
Sample: 1 1002
Included observations: 1002
Failure to improve likelihood (non-zero gradients) after 21 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*GARCH(-1) + C(4)*GARCH(-2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-20061.59	38435626	-0.000522	0.9996
Variance Equation				
C	1.25E-05	0.100441	0.000124	0.9999
GARCH(-1)	-0.057814	2.558302	-0.022599	0.9820
GARCH(-2)	-0.143107	1.824000	-0.078458	0.9375
T-DIST. DOF	2.000072	1.322564	1.512269	0.1305

R-squared	1.000000	Mean dependent var	0.000224
Adjusted R-squared	1.000000	S.D. dependent var	0.013572
S.E. of regression	6.77E-07	Akaike info criterion	-19.62049
Sum squared resid	4.58E-10	Schwarz criterion	-19.59599
Log likelihood	9834.866	Hannan-Quinn criter.	-19.61118
Durbin-Watson stat	1.969269		

Inverted MA Roots	27.17	-13.59+2...	-13.59-23.53i
Estimated MA process is noninvertible			

6. GARCH (0,3)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:28
Sample: 1 1002
Included observations: 1002
Failure to improve likelihood (non-zero gradients) after 139 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*GARCH(-1) + C(4)*GARCH(-2) + C(5)*GARCH(-3)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.120022	0.027511	-4.362703	0.0000
Variance Equation				
C	4.20E-07	3.93E-08	10.67734	0.0000
GARCH(-1)	0.987108	0.001488	663.2410	0.0000
GARCH(-2)	1.015645	0.000394	2576.704	0.0000
GARCH(-3)	-1.005034	0.001510	-665.4394	0.0000
T-DIST. DOF	4.711360	0.788245	5.977027	0.0000

R-squared	0.023152	Mean dependent var	0.000224
Adjusted R-squared	0.023152	S.D. dependent var	0.013572
S.E. of regression	0.013414	Akaike info criterion	-5.893926
Sum squared resid	0.180104	Schwarz criterion	-5.864526
Log likelihood	2958.857	Hannan-Quinn criter.	-5.882753
Durbin-Watson stat	1.993671		

Inverted MA Roots	.49	-.25+.43i	-.25-.43i

7. GARCH (1,1)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:39
Sample: 1 1002
Included observations: 1002
Convergence achieved after 34 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.101368	0.032361	-3.132372	0.0017
Variance Equation				
C	6.45E-06	2.61E-06	2.474158	0.0134
RESID(-1)^2	0.096864	0.024748	3.914033	0.0001
GARCH(-1)	0.868133	0.032482	26.72648	0.0000
T-DIST. DOF	7.058925	1.661625	4.248206	0.0000

R-squared	0.021313	Mean dependent var	0.000224
Adjusted R-squared	0.021313	S.D. dependent var	0.013572
S.E. of regression	0.013426	Akaike info criterion	-5.970966
Sum squared resid	0.180443	Schwarz criterion	-5.946466
Log likelihood	2996.454	Hannan-Quinn criter.	-5.961655
Durbin-Watson stat	1.989830		

Inverted MA Roots	.47	-.23+.40i	-.23-.40i

8. GARCH (1,2)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:41
Sample: 1 1002
Included observations: 1002
Convergence achieved after 39 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1) + C(5)*GARCH(-2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.103764	0.032634	-3.179654	0.0015
Variance Equation				
C	9.21E-06	3.93E-06	2.341700	0.0192
RESID(-1)^2	0.140474	0.038630	3.636371	0.0003
GARCH(-1)	0.314964	0.227415	1.384976	0.1661
GARCH(-2)	0.494015	0.204812	2.412038	0.0159
T-DIST. DOF	7.232333	1.730157	4.180160	0.0000

R-squared	0.021587	Mean dependent var	0.000224
Adjusted R-squared	0.021587	S.D. dependent var	0.013572
S.E. of regression	0.013424	Akaike info criterion	-5.971866
Sum squared resid	0.180392	Schwarz criterion	-5.942467
Log likelihood	2997.905	Hannan-Quinn criter.	-5.960693
Durbin-Watson stat	1.990322		

Inverted MA Roots	.47	-.23+.41i	-.23-.41i

9. GARCH (1,3)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:42
Sample: 1 1002
Included observations: 1002
Convergence achieved after 50 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1) + C(5)*GARCH(-2) + C(6)*GARCH(-3)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.106191	0.031438	-3.377791	0.0007
Variance Equation				
C	1.03E-05	4.51E-06	2.296280	0.0217
RESID(-1)^2	0.162362	0.044561	3.643606	0.0003
GARCH(-1)	0.219822	0.211062	1.041505	0.2976
GARCH(-2)	0.243857	0.238249	1.023537	0.3061
GARCH(-3)	0.316818	0.204054	1.552613	0.1205
T-DIST. DOF	7.254340	1.727292	4.199835	0.0000

R-squared	0.021853	Mean dependent var	0.000224
Adjusted R-squared	0.021853	S.D. dependent var	0.013572
S.E. of regression	0.013422	Akaike info criterion	-5.970904
Sum squared resid	0.180343	Schwarz criterion	-5.936604
Log likelihood	2998.423	Hannan-Quinn criter.	-5.957869
Durbin-Watson stat	1.990820		

Inverted MA Roots	.47	-.24-.41i	-.24+.41i

10. GARCH (2,1)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:42
Sample: 1 1002
Included observations: 1002
Convergence achieved after 40 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*RESID(-2)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.103731	0.031125	-3.332747	0.0009
Variance Equation				
C	3.62E-06	1.77E-06	2.047780	0.0406
RESID(-1)^2	0.178507	0.058509	3.050934	0.0023
RESID(-2)^2	-0.115521	0.057851	-1.996879	0.0458
GARCH(-1)	0.917210	0.025137	36.48829	0.0000
T-DIST. DOF	7.147494	1.694558	4.217910	0.0000

R-squared	0.021583	Mean dependent var	0.000224
Adjusted R-squared	0.021583	S.D. dependent var	0.013572
S.E. of regression	0.013424	Akaike info criterion	-5.973731
Sum squared resid	0.180393	Schwarz criterion	-5.944332
Log likelihood	2998.839	Hannan-Quinn criter.	-5.962559
Durbin-Watson stat	1.990315		

Inverted MA Roots	.47	-.23-.41i	-.23+.41i

11. GARCH (2,2)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:43
Sample: 1 1002
Included observations: 1002
Convergence achieved after 64 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*RESID(-2)^2 + C(5)*GARCH(-1) + C(6)*GARCH(-2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.101253	0.031451	-3.219425	0.0013
Variance Equation				
C	2.25E-06	1.88E-06	1.192032	0.2332
RESID(-1)^2	0.174134	0.057623	3.021951	0.0025
RESID(-2)^2	-0.132498	0.055491	-2.387751	0.0170
GARCH(-1)	1.160347	0.353101	3.286160	0.0010
GARCH(-2)	-0.214280	0.319326	-0.671038	0.5022
T-DIST. DOF	7.094625	1.695537	4.184295	0.0000

R-squared	0.021300	Mean dependent var	0.000224
Adjusted R-squared	0.021300	S.D. dependent var	0.013572
S.E. of regression	0.013426	Akaike info criterion	-5.971997
Sum squared resid	0.180445	Schwarz criterion	-5.937697
Log likelihood	2998.970	Hannan-Quinn criter.	-5.958962
Durbin-Watson stat	1.989807		

Inverted MA Roots	.47	-.23+.40i	-.23-.40i

12. GARCH (2,3)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:44
Sample: 1 1002
Included observations: 1002
Convergence achieved after 68 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*RESID(-2)^2 + C(5)*GARCH(-1) + C(6)*GARCH(-2) + C(7)*GARCH(-3)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.105403	0.030484	-3.457607	0.0005
Variance Equation				
C	1.50E-05	5.90E-06	2.537254	0.0112
RESID(-1)^2	0.137456	0.032141	4.276702	0.0000
RESID(-2)^2	0.098956	0.031518	3.139631	0.0017
GARCH(-1)	-0.474357	0.052620	-9.014837	0.0000
GARCH(-2)	0.355870	0.035501	10.02432	0.0000
GARCH(-3)	0.797528	0.052215	15.27400	0.0000
T-DIST. DOF	7.668611	1.955195	3.922173	0.0001

R-squared	0.021768	Mean dependent var	0.000224
Adjusted R-squared	0.021768	S.D. dependent var	0.013572
S.E. of regression	0.013423	Akaike info criterion	-5.975027
Sum squared resid	0.180359	Schwarz criterion	-5.935828
Log likelihood	3001.489	Hannan-Quinn criter.	-5.960130
Durbin-Watson stat	1.990659		

Inverted MA Roots	.47	-.24-.41i	-.24+.41i

13. GARCH (3,1)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:44
Sample: 1 1002
Included observations: 1002
Convergence achieved after 39 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*RESID(-2)^2 + C(5)*RESID(-3)^2 + C(6)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.102315	0.031110	-3.288796	0.0010
Variance Equation				
C	3.21E-06	1.71E-06	1.874483	0.0609
RESID(-1)^2	0.177176	0.058477	3.029828	0.0024
RESID(-2)^2	-0.101830	0.070182	-1.450951	0.1468
RESID(-3)^2	-0.017374	0.042290	-0.410824	0.6812
GARCH(-1)	0.924485	0.025779	35.86198	0.0000
T-DIST. DOF	7.099960	1.683073	4.218451	0.0000

R-squared	0.021423	Mean dependent var	0.000224
Adjusted R-squared	0.021423	S.D. dependent var	0.013572
S.E. of regression	0.013425	Akaike info criterion	-5.971892
Sum squared resid	0.180423	Schwarz criterion	-5.937593
Log likelihood	2998.918	Hannan-Quinn criter.	-5.958857
Durbin-Watson stat	1.990024		

Inverted MA Roots	.47	-.23+.41i	-.23-.41i

14. GARCH (3,2)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:45
Sample: 1 1002
Included observations: 1002
Failure to improve likelihood (singular hessian) after 391 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*RESID(-2)^2 + C(5)*RESID(-3)^2 + C(6)*GARCH(-1) + C(7)*GARCH(-2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.100690	0.031797	-3.166642	0.0015
Variance Equation				
C	4.38E-07	9.41E-07	0.465756	0.6414
RESID(-1)^2	0.174558	0.057324	3.045107	0.0023
RESID(-2)^2	-0.238004	0.132487	-1.796427	0.0724
RESID(-3)^2	0.071878	0.080294	0.895189	0.3707
GARCH(-1)	1.728598	0.330485	5.230492	0.0000
GARCH(-2)	-0.739475	0.308795	-2.394711	0.0166
T-DIST. DOF	7.248710	1.771976	4.090750	0.0000

R-squared	0.021234	Mean dependent var	0.000224
Adjusted R-squared	0.021234	S.D. dependent var	0.013572
S.E. of regression	0.013427	Akaike info criterion	-5.970404
Sum squared resid	0.180457	Schwarz criterion	-5.931205
Log likelihood	2999.172	Hannan-Quinn criter.	-5.955507
Durbin-Watson stat	1.989691		

Inverted MA Roots	.47	-.23-.40i	-.23+.40i

15. GARCH (3,3)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/21/17 Time: 10:46
Sample: 1 1002
Included observations: 1002
Convergence achieved after 72 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*RESID(-2)^2 + C(5)*RESID(-3)^2 + C(6)*GARCH(-1) + C(7)*GARCH(-2) + C(8)*GARCH(-3)

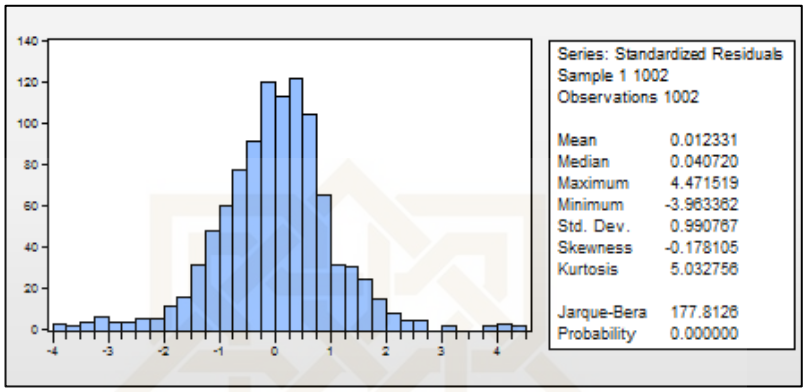
Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.100403	0.032206	-3.117544	0.0018
	Variance Equation			
C	3.02E-06	3.25E-06	0.930107	0.3523
RESID(-1)^2	0.174484	0.056486	3.088977	0.0020
RESID(-2)^2	-0.017365	0.114092	-0.152202	0.8790
RESID(-3)^2	-0.100366	0.089394	-1.122737	0.2615
GARCH(-1)	0.462980	0.623926	0.742042	0.4581
GARCH(-2)	0.767407	0.493644	1.554576	0.1200
GARCH(-3)	-0.303777	0.296041	-1.026130	0.3048
T-DIST. DOF	7.143320	1.729841	4.129467	0.0000

R-squared	0.021200	Mean dependent var	0.000224
Adjusted R-squared	0.021200	S.D. dependent var	0.013572
S.E. of regression	0.013427	Akaike info criterion	-5.968526
Sum squared resid	0.180464	Schwarz criterion	-5.924427
Log likelihood	2999.232	Hannan-Quinn criter.	-5.951767
Durbin-Watson stat	1.989632		

Inverted MA Roots	.46	-.23+.40i	-.23-.40i

Lampiran 6 : Pemeriksaan diagnosa Model GARCH

1. GARCH (2,0)
   a. Uji Normalitas



   b. Uji Autokorelasi

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.008	0.008	0.0589	
		2	-0.052	-0.052	2.7823	0.095
		3	-0.028	-0.027	3.5587	0.169
		4	-0.043	-0.046	5.4314	0.143
		5	0.007	0.005	5.4780	0.242
		6	-0.012	-0.017	5.6144	0.346
		7	0.000	-0.001	5.6146	0.468
		8	-0.016	-0.020	5.8833	0.553
		9	0.017	0.017	6.1732	0.628
		10	-0.016	-0.019	6.4205	0.697
		11	-0.014	-0.012	6.6094	0.762
		12	0.008	0.005	6.6671	0.825
		13	-0.027	-0.027	7.3856	0.831
		14	-0.032	-0.034	8.4346	0.814
		15	-0.002	-0.005	8.4377	0.865
		16	-0.027	-0.033	9.1925	0.867
		17	0.018	0.014	9.5155	0.891
		18	0.033	0.026	10.623	0.875
		19	-0.046	-0.048	12.817	0.802
		20	0.002	0.003	12.821	0.848
		21	-0.018	-0.022	13.151	0.871
		22	0.004	0.003	13.165	0.903
		23	0.064	0.059	17.423	0.740
		24	0.024	0.021	18.014	0.757
		25	0.054	0.059	21.010	0.638
		26	0.056	0.063	24.242	0.505
		27	-0.001	0.007	24.242	0.562
		28	0.005	0.020	24.272	0.615
		29	-0.043	-0.037	26.182	0.563
		30	0.039	0.045	27.739	0.532
		31	-0.002	-0.000	27.745	0.584
		32	-0.004	-0.001	27.761	0.633
		33	-0.032	-0.032	28.835	0.628
		34	-0.050	-0.043	31.382	0.548
		35	0.060	0.052	35.182	0.412
		36	-0.025	-0.025	35.827	0.429

c. Uji Heterokadastisitas

Heteroskedasticity Test: ARCH

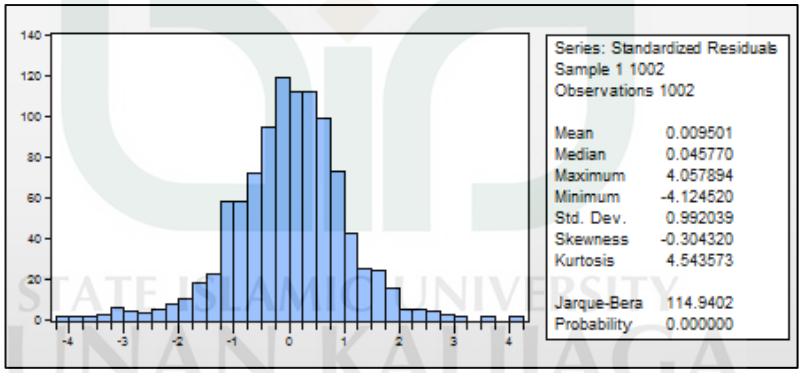
F-statistic	0.388297	Prob. F(1,999)	0.5333
Obs*R-squared	0.388923	Prob. Chi-Square(1)	0.5329

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 07/24/17 Time: 15:49
Sample (adjusted): 2 1002
Included observations: 1001 after adjustments

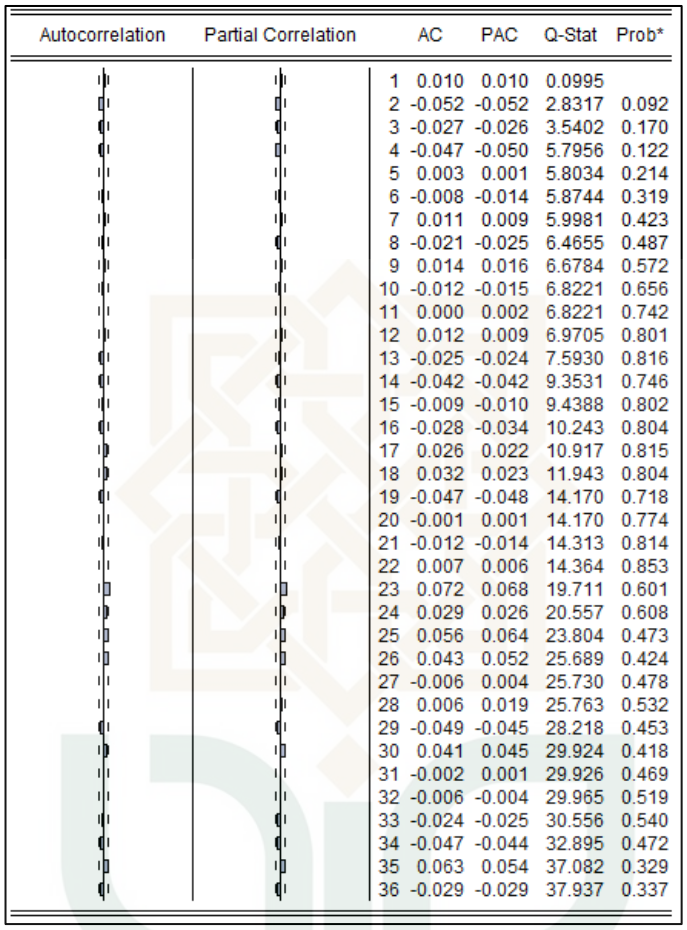
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.001111	0.069561	14.39187	0.0000
WGT_RESID^2(-1)	-0.019709	0.031629	-0.623135	0.5333

R-squared	0.000389	Mean dependent var	0.981771
Adjusted R-squared	-0.000612	S.D. dependent var	1.969000
S.E. of regression	1.969602	Akaike info criterion	4.195536
Sum squared resid	3875.453	Schwarz criterion	4.205344
Log likelihood	-2097.866	Hannan-Quinn criter.	4.199264
F-statistic	0.388297	Durbin-Watson stat	2.001437
Prob(F-statistic)	0.533338		

2. GARCH (3,0)
   a. Uji Normalitas



b. Uji Autokorelasi



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.010	0.010	0.0995	
		2	-0.052	-0.052	2.8317	0.092
		3	-0.027	-0.026	3.5402	0.170
		4	-0.047	-0.050	5.7956	0.122
		5	0.003	0.001	5.8034	0.214
		6	-0.008	-0.014	5.8744	0.319
		7	0.011	0.009	5.9981	0.423
		8	-0.021	-0.025	6.4655	0.487
		9	0.014	0.016	6.6784	0.572
		10	-0.012	-0.015	6.8221	0.656
		11	0.000	0.002	6.8221	0.742
		12	0.012	0.009	6.9705	0.801
		13	-0.025	-0.024	7.5930	0.816
		14	-0.042	-0.042	9.3531	0.746
		15	-0.009	-0.010	9.4388	0.802
		16	-0.028	-0.034	10.243	0.804
		17	0.026	0.022	10.917	0.815
		18	0.032	0.023	11.943	0.804
		19	-0.047	-0.048	14.170	0.718
		20	-0.001	0.001	14.170	0.774
		21	-0.012	-0.014	14.313	0.814
		22	0.007	0.006	14.364	0.853
		23	0.072	0.068	19.711	0.601
		24	0.029	0.026	20.557	0.608
		25	0.056	0.064	23.804	0.473
		26	0.043	0.052	25.689	0.424
		27	-0.006	0.004	25.730	0.478
		28	0.006	0.019	25.763	0.532
		29	-0.049	-0.045	28.218	0.453
		30	0.041	0.045	29.924	0.418
		31	-0.002	0.001	29.926	0.469
		32	-0.006	-0.004	29.965	0.519
		33	-0.024	-0.025	30.556	0.540
		34	-0.047	-0.044	32.895	0.472
		35	0.063	0.054	37.082	0.329
		36	-0.029	-0.029	37.937	0.337

c. Uji Heterokadastisitas

Heteroskedasticity Test: ARCH

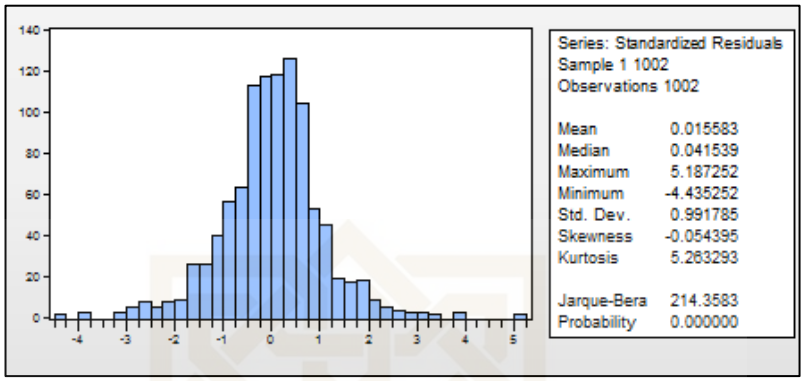
F-statistic	0.092471	Prob. F(1,999)	0.7611
Obs*R-squared	0.092647	Prob. Chi-Square(1)	0.7608

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 07/24/17 Time: 15:51
Sample (adjusted): 2 1002
Included observations: 1001 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.993693	0.066242	15.00092	0.0000
WGT_RESID^2(-1)	-0.009619	0.031633	-0.304090	0.7611

R-squared	0.000093	Mean dependent var	0.984231
Adjusted R-squared	-0.000908	S.D. dependent var	1.849367
S.E. of regression	1.850207	Akaike info criterion	4.070468
Sum squared resid	3419.843	Schwarz criterion	4.080276
Log likelihood	-2035.269	Hannan-Quinn criter.	4.074196
F-statistic	0.092471	Durbin-Watson stat	2.000680
Prob(F-statistic)	0.761123		

3. GARCH (0,3)
   a. Uji Normalitas



   b. Uji Autokorelasi

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.007	0.007	0.0477	
		2	-0.053	-0.053	2.8937	0.089
		3	-0.034	-0.033	4.0395	0.133
		4	-0.043	-0.046	5.9432	0.114
		5	-0.011	-0.014	6.0702	0.194
		6	-0.019	-0.025	6.4431	0.265
		7	0.028	0.024	7.2464	0.299
		8	-0.045	-0.051	9.2808	0.233
		9	0.030	0.031	10.197	0.251
		10	-0.023	-0.029	10.725	0.295
		11	-0.010	-0.008	10.834	0.371
		12	0.008	0.002	10.892	0.452
		13	-0.027	-0.027	11.619	0.477
		14	-0.017	-0.022	11.921	0.534
		15	-0.010	-0.011	12.029	0.604
		16	-0.039	-0.049	13.616	0.555
		17	0.019	0.019	13.997	0.599
		18	0.033	0.022	15.097	0.589
		19	-0.045	-0.049	17.132	0.514
		20	0.002	0.004	17.135	0.581
		21	-0.021	-0.027	17.569	0.616
		22	-0.005	-0.007	17.599	0.674
		23	0.064	0.061	21.786	0.473
		24	0.038	0.029	23.291	0.444
		25	0.049	0.055	25.801	0.363
		26	0.068	0.078	30.589	0.203
		27	0.012	0.017	30.729	0.239
		28	0.013	0.038	30.915	0.275
		29	-0.033	-0.025	32.054	0.272
		30	0.005	0.014	32.075	0.317
		31	-0.016	-0.006	32.343	0.352
		32	-0.002	-0.004	32.347	0.400
		33	-0.033	-0.033	33.482	0.395
		34	-0.059	-0.054	37.142	0.284
		35	0.065	0.052	41.580	0.174
		36	-0.018	-0.018	41.935	0.195

c. Uji Heterokadastisitas

Heteroskedasticity Test: ARCH

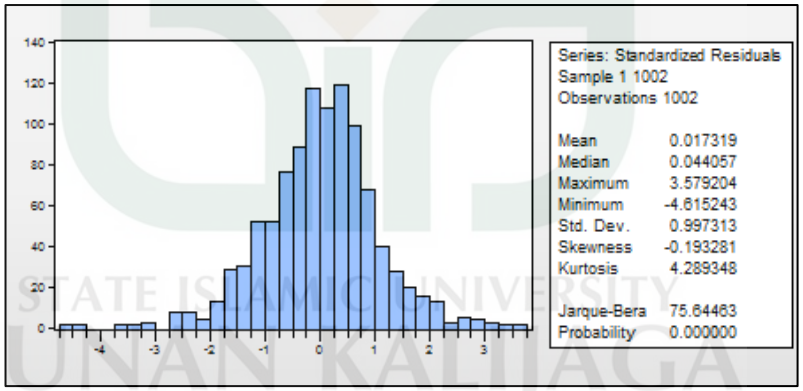
F-statistic	27.21806	Prob. F(1,999)	0.0000
Obs*R-squared	26.54921	Prob. Chi-Square(1)	0.0000

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 07/24/17 Time: 15:52
Sample (adjusted): 2 1002
Included observations: 1001 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.823824	0.070381	11.70517	0.0000
WGT_RESID^2(-1)	0.162839	0.031213	5.217093	0.0000

R-squared	0.026523	Mean dependent var	0.983881
Adjusted R-squared	0.025548	S.D. dependent var	2.030173
S.E. of regression	2.004072	Akaike info criterion	4.230235
Sum squared resid	4012.288	Schwarz criterion	4.240043
Log likelihood	-2115.233	Hannan-Quinn criter.	4.233963
F-statistic	27.21806	Durbin-Watson stat	2.019535
Prob(F-statistic)	0.000000		

4. GARCH (1,1)
   a. Uji Normalitas



b. Uji Autokorelasi

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.002	-0.002	0.0060	
		2	-0.046	-0.046	2.1307	0.144
		3	-0.021	-0.022	2.5881	0.274
		4	-0.043	-0.045	4.4310	0.219
		5	-0.001	-0.004	4.4324	0.351
		6	-0.017	-0.021	4.7090	0.452
		7	0.018	0.016	5.0384	0.539
		8	-0.014	-0.017	5.2252	0.633
		9	0.008	0.009	5.2921	0.726
		10	-0.000	-0.003	5.2922	0.808
		11	-0.004	-0.003	5.3127	0.869
		12	0.010	0.008	5.4129	0.910
		13	-0.019	-0.018	5.7747	0.927
		14	-0.038	-0.039	7.2445	0.889
		15	0.010	0.009	7.3478	0.920
		16	-0.024	-0.028	7.9271	0.927
		17	0.019	0.017	8.3080	0.939
		18	0.023	0.018	8.8278	0.946
		19	-0.045	-0.045	10.907	0.898
		20	0.016	0.016	11.166	0.918
		21	-0.007	-0.008	11.211	0.941
		22	-0.002	-0.003	11.214	0.958
		23	0.071	0.070	16.388	0.796
		24	0.018	0.018	16.736	0.822
		25	0.062	0.069	20.756	0.653
		26	0.057	0.066	24.080	0.515
		27	0.011	0.022	24.208	0.564
		28	0.003	0.016	24.215	0.618
		29	-0.055	-0.043	27.294	0.502
		30	0.030	0.034	28.250	0.505
		31	0.005	0.011	28.280	0.556
		32	-0.007	-0.008	28.335	0.604
		33	-0.039	-0.043	29.880	0.574
		34	-0.030	-0.026	30.802	0.577
		35	0.065	0.055	35.198	0.411
		36	-0.028	-0.026	36.024	0.420

c. Uji Heterokadastisitas

Heteroskedasticity Test: ARCH

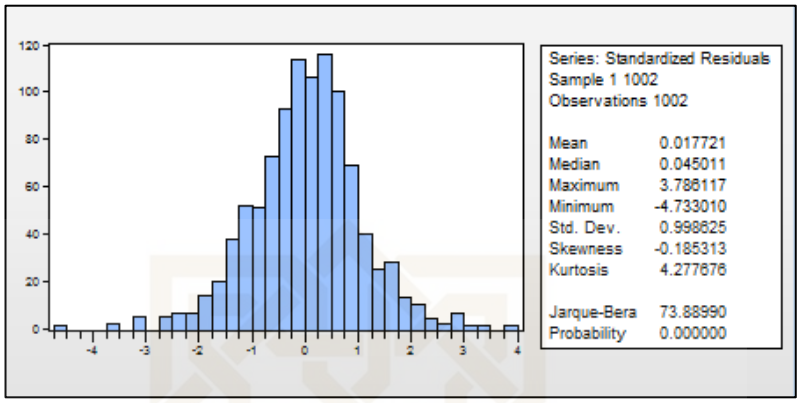
F-statistic	1.860408	Prob. F(1,999)	0.1729
Obs*R-squared	1.860668	Prob. Chi-Square(1)	0.1725

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 07/24/17 Time: 15:55
Sample (adjusted): 2 1002
Included observations: 1001 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.952064	0.064983	14.65089	0.0000
WGT_RESID^2(-1)	0.043109	0.031606	1.363968	0.1729

R-squared	0.001859	Mean dependent var	0.994933
Adjusted R-squared	0.000860	S.D. dependent var	1.800293
S.E. of regression	1.799519	Akaike info criterion	4.014911
Sum squared resid	3235.029	Schwarz criterion	4.024719
Log likelihood	-2007.463	Hannan-Quinn criter.	4.018639
F-statistic	1.860408	Durbin-Watson stat	1.998700
Prob(F-statistic)	0.172885		

5. GARCH (2,1)
   a. Uji Normalitas



   b. Uji Autokorelasi

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.008	-0.008	0.0677	
		2	-0.045	-0.045	2.1086	0.146
		3	-0.022	-0.023	2.6109	0.271
		4	-0.046	-0.049	4.7518	0.191
		5	0.002	-0.001	4.7560	0.313
		6	-0.018	-0.023	5.0839	0.406
		7	0.016	0.014	5.3587	0.499
		8	-0.010	-0.014	5.4639	0.604
		9	0.010	0.010	5.5578	0.697
		10	-0.001	-0.004	5.5595	0.783
		11	-0.006	-0.004	5.5962	0.848
		12	0.007	0.005	5.6422	0.896
		13	-0.018	-0.017	5.9553	0.918
		14	-0.041	-0.042	7.6535	0.865
		15	0.015	0.013	7.8716	0.896
		16	-0.020	-0.025	8.2982	0.911
		17	0.017	0.015	8.5956	0.929
		18	0.025	0.020	9.2334	0.933
		19	-0.045	-0.044	11.330	0.880
		20	0.017	0.016	11.639	0.900
		21	-0.010	-0.010	11.739	0.925
		22	-0.004	-0.005	11.756	0.946
		23	0.072	0.071	17.064	0.760
		24	0.016	0.017	17.333	0.793
		25	0.065	0.070	21.618	0.602
		26	0.055	0.065	24.784	0.475
		27	0.008	0.020	24.848	0.528
		28	0.002	0.015	24.852	0.583
		29	-0.053	-0.041	27.770	0.477
		30	0.034	0.037	28.996	0.465
		31	0.005	0.011	29.024	0.516
		32	-0.006	-0.006	29.065	0.566
		33	-0.042	-0.047	30.929	0.521
		34	-0.030	-0.025	31.841	0.525
		35	0.059	0.048	35.445	0.400
		36	-0.029	-0.026	36.313	0.407

c. Uji Heterokadastisitas

Heteroskedasticity Test: ARCH

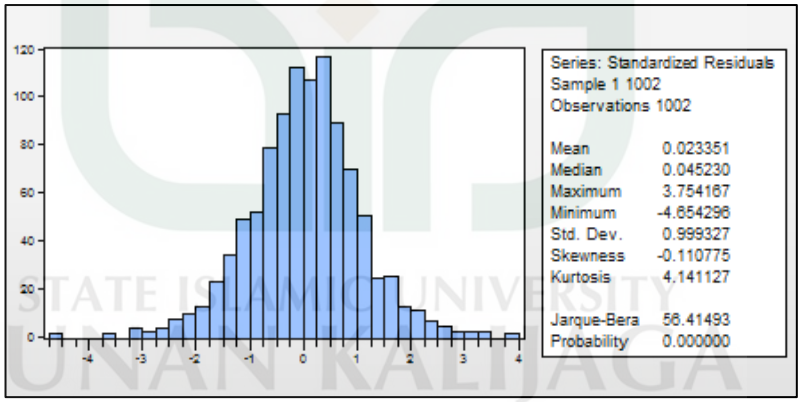
F-statistic	0.048358	Prob. F(1,999)	0.8260
Obs*R-squared	0.048453	Prob. Chi-Square(1)	0.8258

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 07/24/17 Time: 15:56
Sample (adjusted): 2 1002
Included observations: 1001 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.004501	0.065125	15.42411	0.0000
WGT_RESID^2(-1)	-0.006956	0.031634	-0.219905	0.8260

R-squared	0.000048	Mean dependent var	0.997566
Adjusted R-squared	-0.000953	S.D. dependent var	1.801904
S.E. of regression	1.802762	Akaike info criterion	4.018513
Sum squared resid	3246.703	Schwarz criterion	4.028321
Log likelihood	-2009.266	Hannan-Quinn criter.	4.022241
F-statistic	0.048358	Durbin-Watson stat	2.000164
Prob(F-statistic)	0.825990		

6. GARCH (2,3)
   a. Uji Normalitas



b. Uji Autokorelasi

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.009	-0.009	0.0854	
		2	-0.049	-0.049	2.4817	0.115
		3	-0.019	-0.020	2.8392	0.242
		4	-0.041	-0.044	4.5318	0.209
		5	0.001	-0.002	4.5330	0.339
		6	-0.026	-0.030	5.1910	0.393
		7	0.023	0.020	5.7091	0.457
		8	-0.014	-0.019	5.9184	0.549
		9	0.007	0.007	5.9619	0.651
		10	0.003	-0.000	5.9718	0.743
		11	0.001	0.003	5.9728	0.818
		12	0.006	0.004	6.0046	0.873
		13	-0.017	-0.015	6.3057	0.900
		14	-0.035	-0.036	7.5411	0.872
		15	0.017	0.016	7.8227	0.898
		16	-0.026	-0.031	8.5239	0.901
		17	0.017	0.015	8.8023	0.921
		18	0.022	0.017	9.2842	0.931
		19	-0.048	-0.047	11.602	0.867
		20	0.019	0.017	11.962	0.887
		21	-0.001	-0.002	11.963	0.917
		22	-0.004	-0.005	11.976	0.940
		23	0.075	0.076	17.757	0.720
		24	0.016	0.017	18.009	0.757
		25	0.059	0.065	21.544	0.606
		26	0.061	0.072	25.318	0.445
		27	0.001	0.013	25.319	0.501
		28	-0.002	0.011	25.325	0.556
		29	-0.052	-0.039	28.069	0.461
		30	0.031	0.032	29.067	0.462
		31	0.007	0.013	29.125	0.511
		32	-0.008	-0.008	29.187	0.560
		33	-0.040	-0.046	30.874	0.523
		34	-0.032	-0.028	31.965	0.518
		35	0.065	0.053	36.346	0.360
		36	-0.027	-0.025	37.129	0.371

c. Uji Heterokadastisitas

Heteroskedasticity Test: ARCH

F-statistic	0.379883	Prob. F(1,999)	0.5378
Obs*R-squared	0.380499	Prob. Chi-Square(1)	0.5373

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 07/24/17 Time: 15:57
Sample (adjusted): 2 1002
Included observations: 1001 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.979729	0.064191	15.26281	0.0000
WGT_RESID^2(-1)	0.019495	0.031630	0.616347	0.5378

R-squared	0.000380	Mean dependent var	0.999201
Adjusted R-squared	-0.000621	S.D. dependent var	1.767354
S.E. of regression	1.767902	Akaike info criterion	3.979460
Sum squared resid	3122.351	Schwarz criterion	3.989268
Log likelihood	-1989.720	Hannan-Quinn criter.	3.983187
F-statistic	0.379883	Durbin-Watson stat	2.000682
Prob(F-statistic)	0.537806		

Lampiran 7 : Estimasi Model AGARCH

1. AGARCH (1,0)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:07
Sample: 1 1002
Included observations: 1002
Convergence achieved after 158 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(5) = C(2) + C(3)*(ABS(RESID(-1)) - C(4)*RESID(-1))^C(5)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.119884	0.025414	-4.717160	0.0000
Variance Equation				
C(2)	0.011358	0.021661	0.524352	0.6000
C(3)	0.288497	0.061170	4.716324	0.0000
C(4)	0.328518	0.129428	2.538234	0.0111
C(5)	0.979448	0.434671	2.253309	0.0242
T-DIST. DOF	5.354237	1.019910	5.249718	0.0000

R-squared	0.023141	Mean dependent var	0.000224
Adjusted R-squared	0.023141	S.D. dependent var	0.013572
S.E. of regression	0.013414	Akaike info criterion	-5.926288
Sum squared resid	0.180106	Schwarz criterion	-5.896889
Log likelihood	2975.070	Hannan-Quinn criter.	-5.915116
Durbin-Watson stat	1.993643		

Inverted MA Roots	.49	-.25+.43i	-.25-.43i

2. AGARCH (2,0)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:18
Sample: 1 1002
Included observations: 1002
Convergence achieved after 98 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(6) = C(2) + C(3)*(ABS(RESID(-1)) - C(4)*RESID(-1))^C(6) + C(5)*ABS(RESID(-2))^C(6)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.108054	0.026857	-4.023312	0.0001
Variance Equation				
C(2)	0.001435	0.003514	0.408285	0.6831
C(3)	0.271194	0.065537	4.138002	0.0000
C(4)	0.313677	0.138718	2.261260	0.0237
C(5)	0.134491	0.052356	2.568761	0.0102
C(6)	1.425961	0.554209	2.572964	0.0101
T-DIST. DOF	5.299838	1.004096	5.278220	0.0000

R-squared	0.022049	Mean dependent var	0.000224
Adjusted R-squared	0.022049	S.D. dependent var	0.013572
S.E. of regression	0.013421	Akaike info criterion	-5.934285
Sum squared resid	0.180307	Schwarz criterion	-5.899985
Log likelihood	2980.077	Hannan-Quinn criter.	-5.921250
Durbin-Watson stat	1.991203		

Inverted MA Roots	.48	-.24-.41i	-.24+.41i

3. AGARCH (3,0)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:23
Sample: 1 1002
Included observations: 1002
Convergence achieved after 93 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(7) = C(2) + C(3)*(ABS(RESID(-1)) - C(4)*RESID(-1))^C(7) + C(5)*ABS(RESID(-2))^C(7) + C(6)*ABS(RESID(-3))^C(7)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.105119	0.032089	-3.275819	0.0011
Variance Equation				
C(2)	0.001672	0.003587	0.466260	0.6410
C(3)	0.238096	0.060102	3.961518	0.0001
C(4)	0.365041	0.158450	2.303829	0.0212
C(5)	0.107326	0.048827	2.198114	0.0279
C(6)	0.149283	0.046078	3.239802	0.0012
C(7)	1.361306	0.483457	2.815774	0.0049
T-DIST. DOF	5.934658	1.289395	4.602668	0.0000

R-squared	0.021737	Mean dependent var	0.000224
Adjusted R-squared	0.021737	S.D. dependent var	0.013572
S.E. of regression	0.013423	Akaike info criterion	-5.943761
Sum squared resid	0.180365	Schwarz criterion	-5.904561
Log likelihood	2985.824	Hannan-Quinn criter.	-5.928863
Durbin-Watson stat	1.990600		

Inverted MA Roots	.47	-.24+.41i	-.24-.41i

4. AGARCH (0,1)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:02
Sample: 1 1002
Included observations: 1002
Convergence not achieved after 500 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(4) = C(2) + C(3)*@SQRT(GARCH(-1))^C(4)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.112308	0.026863	-4.180744	0.0000
Variance Equation				
C(2)	1.11E-05	0.002044	0.005430	0.9957
C(3)	0.877016	0.632438	1.386722	0.1655
C(4)	2.173081	41.84653	0.051930	0.9586
T-DIST. DOF	4.185311	0.664781	6.295778	0.0000

R-squared	0.022473	Mean dependent var	0.000224
Adjusted R-squared	0.022473	S.D. dependent var	0.013572
S.E. of regression	0.013418	Akaike info criterion	-5.877932
Sum squared resid	0.180229	Schwarz criterion	-5.853433
Log likelihood	2949.844	Hannan-Quinn criter.	-5.868622
Durbin-Watson stat	1.992079		

Inverted MA Roots	.48	-.24-.42i	-.24+.42i

5. AGARCH (0,2)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:04
Sample: 1 1002
Included observations: 1002
Failure to improve likelihood (non-zero gradients) after 307 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(5) = C(2) + C(3)*@SQRT(GARCH(-1))^C(5) + C(4)
*@SQRT(GARCH(-2))^C(5)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.109347	0.026784	-4.082514	0.0000
Variance Equation				
C(2)	3.59E-09	4.53E-08	0.079111	0.9369
C(3)	-0.073640	0.003438	-21.41939	0.0000
C(4)	0.932887	0.003221	289.5822	0.0000
C(5)	4.101254	2.969519	1.381117	0.1672
T-DIST. DOF	4.101425	0.636625	6.442449	0.0000

R-squared	0.022182	Mean dependent var	0.000224
Adjusted R-squared	0.022182	S.D. dependent var	0.013572
S.E. of regression	0.013420	Akaike info criterion	-5.881663
Sum squared resid	0.180283	Schwarz criterion	-5.852263
Log likelihood	2952.713	Hannan-Quinn criter.	-5.870490
Durbin-Watson stat	1.991469		

Inverted MA Roots	.48	-.24-.41i	-.24+.41i

6. AGARCH (0,3)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:05
Sample: 1 1002
Included observations: 1002
Failure to improve likelihood (singular hessian) after 306 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(6) = C(2) + C(3)*@SQRT(GARCH(-1))^C(6) + C(4)
@SQRT(GARCH(-2))^C(6) + C(5)@SQRT(GARCH(-3))^C(6)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.108974	0.026940	-4.045077	0.0001
Variance Equation				
C(2)	3.46E-09	4.08E-08	0.084969	0.9323
C(3)	0.898617	0.033023	27.21188	0.0000
C(4)	0.941034	0.009201	102.2701	0.0000
C(5)	-0.973598	0.032804	-29.67886	0.0000
C(6)	4.092873	2.757891	1.484059	0.1378
T-DIST. DOF	4.092898	0.644477	6.350731	0.0000

R-squared	0.022144	Mean dependent var	0.000224
Adjusted R-squared	0.022144	S.D. dependent var	0.013572
S.E. of regression	0.013420	Akaike info criterion	-5.881771
Sum squared resid	0.180290	Schwarz criterion	-5.847471
Log likelihood	2953.767	Hannan-Quinn criter.	-5.868736
Durbin-Watson stat	1.991393		

Inverted MA Roots	.48	-.24-.41i	-.24+.41i

7. AGARCH (1,1)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:08
Sample: 1 1002
Included observations: 1002
Convergence achieved after 97 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(6) = C(2) + C(3)*(ABS(RESID(-1)) - C(4)*RESID(-1))^C(6) + C(5)*@SQRT(GARCH(-1))^C(6)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.100222	0.031074	-3.225271	0.0013
Variance Equation				
C(2)	0.000955	0.001479	0.645566	0.5186
C(3)	0.086528	0.020556	4.209375	0.0000
C(4)	0.571786	0.178850	3.197012	0.0014
C(5)	0.902794	0.024031	37.56726	0.0000
C(6)	0.816264	0.335930	2.429868	0.0151
T-DIST. DOF	7.507445	1.902249	3.946614	0.0001

R-squared	0.021179	Mean dependent var	0.000224
Adjusted R-squared	0.021179	S.D. dependent var	0.013572
S.E. of regression	0.013427	Akaike info criterion	-5.979795
Sum squared resid	0.180468	Schwarz criterion	-5.945495
Log likelihood	3002.877	Hannan-Quinn criter.	-5.966760
Durbin-Watson stat	1.989595		

Inverted MA Roots	.46	-.23+.40i	-.23-.40i

8. AGARCH (1,2)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:11
Sample: 1 1002
Included observations: 1002
Convergence achieved after 121 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(7) = C(2) + C(3)*(ABS(RESID(-1)) - C(4)*RESID(-1))^C(7) + C(5)*@SQRT(GARCH(-1))^C(7) + C(6)*@SQRT(GARCH(-2))^C(7)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.118006	0.029860	-3.951906	0.0001
Variance Equation				
C(2)	0.003517	0.004783	0.735447	0.4621
C(3)	0.122172	0.030365	4.023454	0.0001
C(4)	0.564211	0.161240	3.499208	0.0005
C(5)	0.316756	0.207290	1.528084	0.1265
C(6)	0.546053	0.195059	2.799420	0.0051
C(7)	0.590383	0.287169	2.055875	0.0398
T-DIST. DOF	7.830627	2.039398	3.839675	0.0001

R-squared	0.022986	Mean dependent var	0.000224
Adjusted R-squared	0.022986	S.D. dependent var	0.013572
S.E. of regression	0.013415	Akaike info criterion	-5.981873
Sum squared resid	0.180135	Schwarz criterion	-5.942674
Log likelihood	3004.918	Hannan-Quinn criter.	-5.966976
Durbin-Watson stat	1.993254		

Inverted MA Roots	.49	-.25+.42i	-.25-.42i

9. AGARCH (1,3)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:13
Sample: 1 1002
Included observations: 1002
Convergence achieved after 146 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(8) = C(2) + C(3)*(ABS(RESID(-1)) - C(4)*RESID(-1))^C(8) + C(5)*@SQRT(GARCH(-1))^C(8) + C(6)*@SQRT(GARCH(-2))^C(8) + C(7)*@SQRT(GARCH(-3))^C(8)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.113832	0.026965	-4.221494	0.0000
Variance Equation				
C(2)	0.004795	0.006258	0.766327	0.4435
C(3)	0.133741	0.035289	3.789850	0.0002
C(4)	0.594610	0.158430	3.753139	0.0002
C(5)	0.318416	0.222876	1.428669	0.1531
C(6)	0.282447	0.271442	1.040542	0.2981
C(7)	0.247478	0.222405	1.112739	0.2658
C(8)	0.545642	0.274571	1.987252	0.0469
T-DIST. DOF	7.935199	2.078511	3.817732	0.0001

R-squared	0.022616	Mean dependent var	0.000224
Adjusted R-squared	0.022616	S.D. dependent var	0.013572
S.E. of regression	0.013417	Akaike info criterion	-5.980987
Sum squared resid	0.180203	Schwarz criterion	-5.936888
Log likelihood	3005.475	Hannan-Quinn criter.	-5.964228
Durbin-Watson stat	1.992393		

Inverted MA Roots	.48	-.24+.42i	-.24-.42i

10. AGARCH (2,1)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:20
Sample: 1 1002
Included observations: 1002
Convergence achieved after 113 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(7) = C(2) + C(3)*(ABS(RESID(-1)) - C(4)*RESID(-1))^C(7) + C(5)*ABS(RESID(-2))^C(7) + C(6)*@SQRT(GARCH(-1))^C(7)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.106610	0.030137	-3.537547	0.0004
Variance Equation				
C(2)	0.001121	0.001717	0.653294	0.5136
C(3)	0.147228	0.046969	3.134554	0.0017
C(4)	0.293756	0.134418	2.185385	0.0289
C(5)	-0.080782	0.048559	-1.663593	0.0962
C(6)	0.924986	0.022055	41.93906	0.0000
C(7)	0.715109	0.320666	2.230076	0.0257
T-DIST. DOF	7.678753	1.999832	3.839698	0.0001

R-squared	0.021898	Mean dependent var	0.000224
Adjusted R-squared	0.021898	S.D. dependent var	0.013572
S.E. of regression	0.013422	Akaike info criterion	-5.980970
Sum squared resid	0.180335	Schwarz criterion	-5.941770
Log likelihood	3004.466	Hannan-Quinn criter.	-5.966073
Durbin-Watson stat	1.990907		

Inverted MA Roots	.47	-.24-.41i	-.24+.41i

11. AGARCH (2,2)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:21
Sample: 1 1002
Included observations: 1002
Convergence achieved after 125 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(8) = C(2) + C(3)*(ABS(RESID(-1)) - C(4)*RESID(-1))^C(8) + C(5)*ABS(RESID(-2))^C(8) + C(6)*@SQRT(GARCH(-1))^C(8) + C(7)*@SQRT(GARCH(-2))^C(8)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.118007	0.029419	-4.011283	0.0001
Variance Equation				
C(2)	0.003024	0.004290	0.704899	0.4809
C(3)	0.146359	0.042858	3.414972	0.0006
C(4)	0.425820	0.182072	2.338751	0.0193
C(5)	-0.051228	0.050704	-1.010345	0.3123
C(6)	0.488281	0.274786	1.776952	0.0756
C(7)	0.402980	0.249218	1.616976	0.1059
C(8)	0.575501	0.286631	2.007812	0.0447
T-DIST. DOF	7.989077	2.127852	3.754527	0.0002

R-squared	0.022986	Mean dependent var	0.000224
Adjusted R-squared	0.022986	S.D. dependent var	0.013572
S.E. of regression	0.013415	Akaike info criterion	-5.981133
Sum squared resid	0.180134	Schwarz criterion	-5.937034
Log likelihood	3005.548	Hannan-Quinn criter.	-5.964374
Durbin-Watson stat	1.993255		

Inverted MA Roots	.49	-.25-.42i	-.25+.42i

12. AGARCH (2,3)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/28/17 Time: 20:18
Sample: 1 1002
Included observations: 1002
Convergence achieved after 116 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(9) = C(2) + C(3)*(ABS(RESID(-1)) - C(4)*RESID(-1))^C(9) + C(5)*ABS(RESID(-2))^C(9) + C(6)*@SQRT(GARCH(-1))^C(9) + C(7)*@SQRT(GARCH(-2))^C(9) + C(8)*@SQRT(GARCH(-3))^C(9)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.114906	0.028640	-4.012131	0.0001
Variance Equation				
C(2)	0.003434	0.004914	0.698702	0.4847
C(3)	0.146617	0.042203	3.474109	0.0005
C(4)	0.488583	0.208998	2.337734	0.0194
C(5)	-0.035446	0.057589	-0.615500	0.5382
C(6)	0.447069	0.335692	1.331784	0.1829
C(7)	0.261103	0.282786	0.923325	0.3558
C(8)	0.165364	0.265918	0.621862	0.5340
C(9)	0.581631	0.286981	2.026724	0.0427
T-DIST. DOF	7.974485	2.108459	3.782139	0.0002

R-squared	0.022715	Mean dependent var	0.000224
Adjusted R-squared	0.022715	S.D. dependent var	0.013572
S.E. of regression	0.013417	Akaike info criterion	-5.979473
Sum squared resid	0.180184	Schwarz criterion	-5.930474
Log likelihood	3005.716	Hannan-Quinn criter.	-5.960852
Durbin-Watson stat	1.992615		

Inverted MA Roots	.49	-.24-.42i	-.24+.42i

13. AGARCH (3,1)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:24
Sample: 1 1002
Included observations: 1002
Convergence achieved after 140 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(8) = C(2) + C(3)*(ABS(RESID(-1)) - C(4)*RESID(-1))^C(8) + C(5)*ABS(RESID(-2))^C(8) + C(6)*ABS(RESID(-3))^C(8) + C(7)*@SQRT(GARCH(-1))^C(8)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.114904	0.021080	-5.450940	0.0000
Variance Equation				
C(2)	0.003123	0.004263	0.732648	0.4638
C(3)	0.138053	0.042930	3.215778	0.0013
C(4)	0.341475	0.140561	2.429367	0.0151
C(5)	-0.106435	0.055911	-1.903645	0.0570
C(6)	0.036705	0.037057	0.990501	0.3219
C(7)	0.918136	0.024771	37.06470	0.0000
C(8)	0.514983	0.275099	1.871987	0.0612
T-DIST. DOF	7.967016	2.139345	3.724044	0.0002

R-squared	0.022714	Mean dependent var	0.000224
Adjusted R-squared	0.022714	S.D. dependent var	0.013572
S.E. of regression	0.013417	Akaike info criterion	-5.979780
Sum squared resid	0.180185	Schwarz criterion	-5.935680
Log likelihood	3004.870	Hannan-Quinn criter.	-5.963021
Durbin-Watson stat	1.992614		

Inverted MA Roots	.49	-.24-.42i	-.24+.42i

14. AGARCH (3,2)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:24
Sample: 1 1002
Included observations: 1002
Convergence achieved after 129 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(9) = C(2) + C(3)*(ABS(RESID(-1)) - C(4)*RESID(-1))^C(9) + C(5)*ABS(RESID(-2))^C(9) + C(6)*ABS(RESID(-3))^C(9) + C(7)*@SQRT(GARCH(-1))^C(9) + C(8)*@SQRT(GARCH(-2))^C(9)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.118007	0.028801	-4.097292	0.0000
Variance Equation				
C(2)	0.003434	0.004778	0.718769	0.4723
C(3)	0.142023	0.043556	3.260674	0.0011
C(4)	0.439430	0.187655	2.341688	0.0192
C(5)	-0.057241	0.075822	-0.754929	0.4503
C(6)	0.009305	0.058452	0.159189	0.8735
C(7)	0.516790	0.413474	1.249871	0.2113
C(8)	0.374717	0.389533	0.961966	0.3361
C(9)	0.548205	0.280578	1.953843	0.0507
T-DIST. DOF	8.028865	2.152742	3.729598	0.0002

R-squared	0.022986	Mean dependent var	0.000224
Adjusted R-squared	0.022986	S.D. dependent var	0.013572
S.E. of regression	0.013415	Akaike info criterion	-5.979224
Sum squared resid	0.180134	Schwarz criterion	-5.930225
Log likelihood	3005.591	Hannan-Quinn criter.	-5.960603
Durbin-Watson stat	1.993255		

Inverted MA Roots	.49	-.25-.42i	-.25+.42i

15. AGARCH (3,3)

Dependent Variable: SAHAM
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Date: 07/22/17 Time: 10:25
Sample: 1 1002
Included observations: 1002
Convergence achieved after 120 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(10) = C(2) + C(3)*(ABS(RESID(-1)) - C(4)*RESID(-1))^C(10) + C(5)*ABS(RESID(-2))^C(10) + C(6)*ABS(RESID(-3))^C(10) + C(7)*@SQRT(GARCH(-1))^C(10) + C(8)*@SQRT(GARCH(-2))^C(10) + C(9)*@SQRT(GARCH(-3))^C(10)

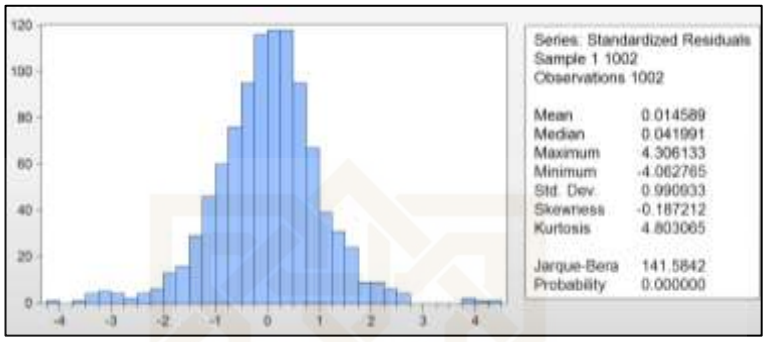
Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(3)	-0.114902	0.029192	-3.936151	0.0001
	Variance Equation			
C(2)	0.002747	0.004063	0.676168	0.4989
C(3)	0.139485	0.042852	3.254996	0.0011
C(4)	0.526150	0.213882	2.460001	0.0139
C(5)	-0.051051	0.067513	-0.756172	0.4495
C(6)	0.035377	0.055683	0.635327	0.5252
C(7)	0.572233	0.377099	1.517461	0.1292
C(8)	0.006261	0.421382	0.014858	0.9881
C(9)	0.282537	0.262723	1.075420	0.2822
C(10)	0.651928	0.303924	2.145041	0.0319
T-DIST. DOF	8.018833	2.119790	3.782844	0.0002

R-squared	0.022714	Mean dependent var	0.000224
Adjusted R-squared	0.022714	S.D. dependent var	0.013572
S.E. of regression	0.013417	Akaike info criterion	-5.977726
Sum squared resid	0.180185	Schwarz criterion	-5.923826
Log likelihood	3005.841	Hannan-Quinn criter.	-5.957242
Durbin-Watson stat	1.992614		

Inverted MA Roots	.49	-.24+.42i	-.24-.42i

Lampiran 8 : Uji diagnosa Model AGARCH

1. AGARCH (1,0)
   a. Uji Normalitas



   b. Uji Autokorelasi

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.000	0.000	0.0001	
		2	-0.060	-0.060	3.5674	0.059
		3	-0.013	-0.013	3.7437	0.154
		4	-0.041	-0.044	5.3975	0.145
		5	0.007	0.005	5.4480	0.244
		6	-0.019	-0.024	5.8067	0.325
		7	0.008	0.008	5.8712	0.438
		8	-0.030	-0.034	6.7597	0.454
		9	0.010	0.011	6.8589	0.552
		10	-0.018	-0.024	7.1941	0.617
		11	-0.015	-0.014	7.4199	0.685
		12	0.010	0.004	7.5133	0.756
		13	-0.034	-0.035	8.6971	0.729
		14	-0.028	-0.031	9.4903	0.735
		15	0.010	0.005	9.5860	0.792
		16	-0.034	-0.041	10.780	0.768
		17	0.022	0.020	11.276	0.792
		18	0.032	0.025	12.355	0.778
		19	-0.049	-0.049	14.777	0.677
		20	0.000	0.001	14.777	0.737
		21	-0.020	-0.025	15.172	0.766
		22	-0.009	-0.012	15.264	0.809
		23	0.069	0.064	20.203	0.570
		24	0.027	0.022	20.944	0.584
		25	0.061	0.068	24.831	0.415
		26	0.050	0.057	27.452	0.334
		27	-0.006	0.002	27.487	0.384
		28	0.004	0.018	27.505	0.437
		29	-0.032	-0.027	28.532	0.437
		30	0.043	0.047	30.475	0.391
		31	-0.010	-0.003	30.584	0.436
		32	-0.004	-0.001	30.601	0.486
		33	-0.030	-0.029	31.543	0.490
		34	-0.054	-0.045	34.537	0.394
		35	0.055	0.044	37.719	0.303
		36	-0.012	-0.007	37.880	0.339

c. Uji Heterokadastisitas

Heteroskedasticity Test: ARCH

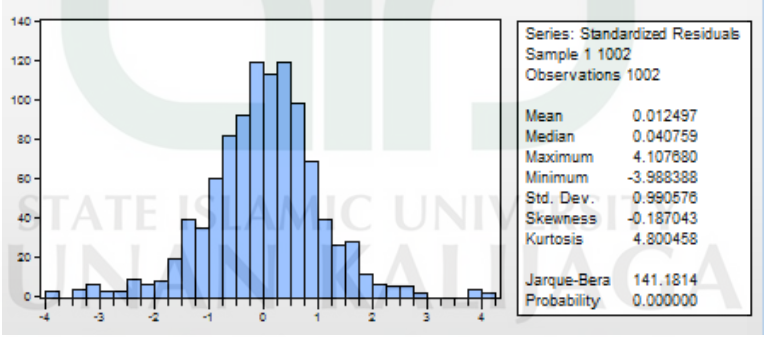
F-statistic	0.525133	Prob. F(1,999)	0.4688
Obs*R-squared	0.525908	Prob. Chi-Square(1)	0.4683

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 07/28/17 Time: 21:00
Sample (adjusted): 2 1002
Included observations: 1001 after adjustments

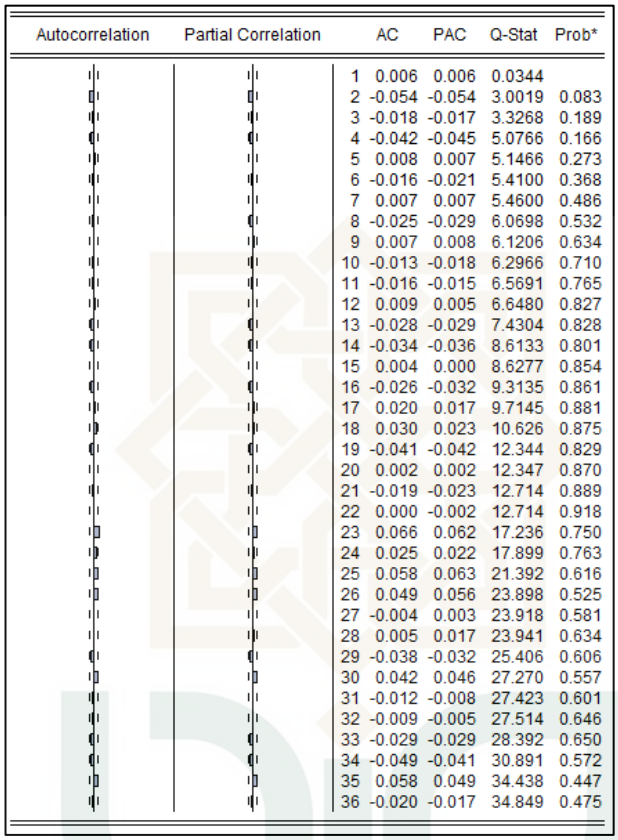
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.004660	0.067957	14.78371	0.0000
WGT_RESID^2(-1)	-0.022919	0.031627	-0.724661	0.4688

R-squared	0.000525	Mean dependent var	0.982162
Adjusted R-squared	-0.000475	S.D. dependent var	1.912132
S.E. of regression	1.912586	Akaike info criterion	4.136785
Sum squared resid	3654.327	Schwarz criterion	4.146593
Log likelihood	-2068.461	Hannan-Quinn criter.	4.140513
F-statistic	0.525133	Durbin-Watson stat	1.997369
Prob(F-statistic)	0.468830		

2. AGARCH (2,0)
   a. Uji Normalitas



b. Uji Autokorelasi



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.006	0.006	0.0344	
		2	-0.054	-0.054	3.0019	0.083
		3	-0.018	-0.017	3.3268	0.189
		4	-0.042	-0.045	5.0766	0.166
		5	0.008	0.007	5.1466	0.273
		6	-0.016	-0.021	5.4100	0.368
		7	0.007	0.007	5.4600	0.486
		8	-0.025	-0.029	6.0698	0.532
		9	0.007	0.008	6.1206	0.634
		10	-0.013	-0.018	6.2966	0.710
		11	-0.016	-0.015	6.5691	0.765
		12	0.009	0.005	6.6480	0.827
		13	-0.028	-0.029	7.4304	0.828
		14	-0.034	-0.036	8.6133	0.801
		15	0.004	0.000	8.6277	0.854
		16	-0.026	-0.032	9.3135	0.861
		17	0.020	0.017	9.7145	0.881
		18	0.030	0.023	10.626	0.875
		19	-0.041	-0.042	12.344	0.829
		20	0.002	0.002	12.347	0.870
		21	-0.019	-0.023	12.714	0.889
		22	0.000	-0.002	12.714	0.918
		23	0.066	0.062	17.236	0.750
		24	0.025	0.022	17.899	0.763
		25	0.058	0.063	21.392	0.616
		26	0.049	0.056	23.898	0.525
		27	-0.004	0.003	23.918	0.581
		28	0.005	0.017	23.941	0.634
		29	-0.038	-0.032	25.406	0.606
		30	0.042	0.046	27.270	0.557
		31	-0.012	-0.008	27.423	0.601
		32	-0.009	-0.005	27.514	0.646
		33	-0.029	-0.029	28.392	0.650
		34	-0.049	-0.041	30.891	0.572
		35	0.058	0.049	34.438	0.447
		36	-0.020	-0.017	34.849	0.475

c. Uji Heterokadastisitas

Heteroskedasticity Test: ARCH

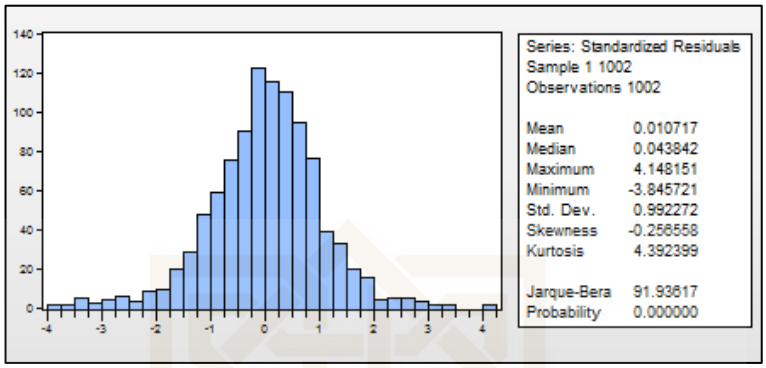
F-statistic	0.804477	Prob. F(1,999)	0.3700
Obs*R-squared	0.805439	Prob. Chi-Square(1)	0.3695

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 07/28/17 Time: 21:01
Sample (adjusted): 2 1002
Included observations: 1001 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.009217	0.067889	14.86574	0.0000
WGT_RESID^2(-1)	-0.028363	0.031623	-0.896926	0.3700

R-squared	0.000805	Mean dependent var	0.981397
Adjusted R-squared	-0.000196	S.D. dependent var	1.910437
S.E. of regression	1.910623	Akaike info criterion	4.134732
Sum squared resid	3646.831	Schwarz criterion	4.144540
Log likelihood	-2067.433	Hannan-Quinn criter.	4.138460
F-statistic	0.804477	Durbin-Watson stat	2.001896
Prob(F-statistic)	0.369974		

3. AGARCH (3,0)
   a. Uji Normalitas



   b. Uji Autokorelasi

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.007	0.007	0.0425	
		2	-0.054	-0.054	2.9554	0.086
		3	-0.012	-0.011	3.0897	0.213
		4	-0.047	-0.050	5.3455	0.148
		5	0.002	0.001	5.3497	0.253
		6	-0.013	-0.018	5.5165	0.356
		7	0.015	0.014	5.7380	0.453
		8	-0.029	-0.034	6.6009	0.472
		9	0.007	0.009	6.6548	0.574
		10	-0.011	-0.016	6.7867	0.659
		11	-0.005	-0.003	6.8073	0.744
		12	0.014	0.009	7.0136	0.798
		13	-0.026	-0.026	7.7048	0.808
		14	-0.043	-0.044	9.5799	0.728
		15	-0.002	-0.003	9.5846	0.792
		16	-0.026	-0.032	10.280	0.802
		17	0.025	0.023	10.933	0.814
		18	0.029	0.020	11.779	0.813
		19	-0.042	-0.042	13.548	0.758
		20	0.002	0.003	13.552	0.809
		21	-0.012	-0.015	13.707	0.845
		22	0.003	0.002	13.716	0.882
		23	0.072	0.069	19.034	0.643
		24	0.030	0.026	19.940	0.646
		25	0.061	0.068	23.752	0.476
		26	0.040	0.048	25.390	0.441
		27	-0.009	0.000	25.476	0.492
		28	0.003	0.013	25.483	0.547
		29	-0.045	-0.041	27.575	0.487
		30	0.043	0.046	29.452	0.442
		31	-0.011	-0.007	29.579	0.487
		32	-0.012	-0.007	29.721	0.532
		33	-0.021	-0.023	30.173	0.559
		34	-0.049	-0.044	32.626	0.486
		35	0.061	0.052	36.459	0.355
		36	-0.024	-0.023	37.074	0.374

c. Uji Heterokadastisitas

Heteroskedasticity Test: ARCH

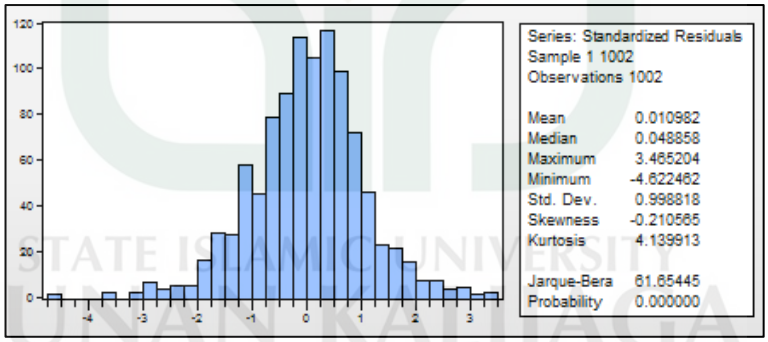
F-statistic	0.590052	Prob. F(1,999)	0.4426
Obs*R-squared	0.590884	Prob. Chi-Square(1)	0.4421

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 07/28/17 Time: 21:02
Sample (adjusted): 2 1002
Included observations: 1001 after adjustments

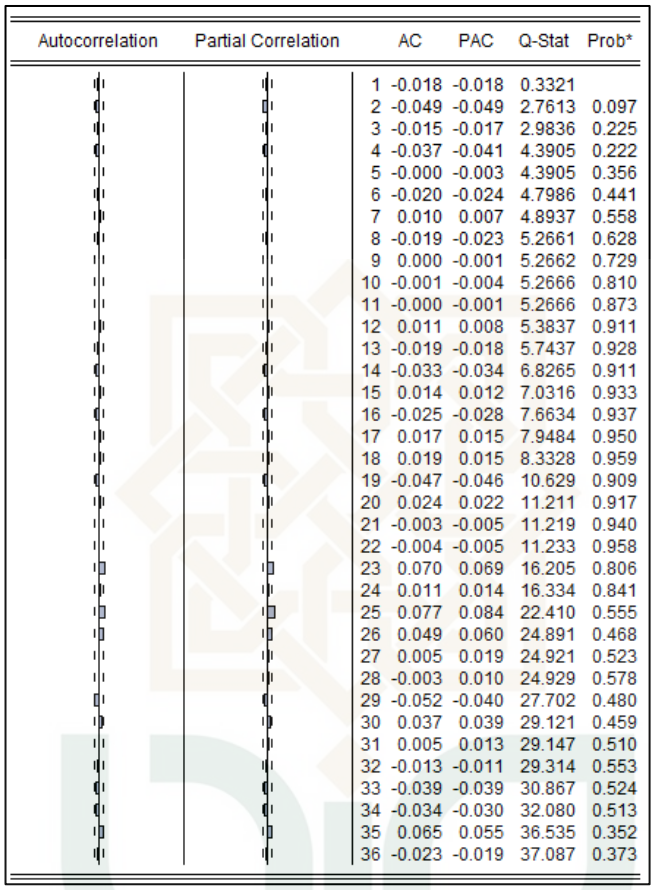
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.008624	0.065146	15.48244	0.0000
WGT_RESID^2(-1)	-0.024293	0.031625	-0.768148	0.4426

R-squared	0.000590	Mean dependent var	0.984719
Adjusted R-squared	-0.000410	S.D. dependent var	1.810381
S.E. of regression	1.810752	Akaike info criterion	4.027357
Sum squared resid	3275.543	Schwarz criterion	4.037165
Log likelihood	-2013.692	Hannan-Quinn criter.	4.031085
F-statistic	0.590052	Durbin-Watson stat	2.001315
Prob(F-statistic)	0.442581		

4. GARCH (1,1)
   a. Uji Normalitas



b. Uji Autokorelasi



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.018	-0.018	0.3321	
		2	-0.049	-0.049	2.7613	0.097
		3	-0.015	-0.017	2.9836	0.225
		4	-0.037	-0.041	4.3905	0.222
		5	-0.000	-0.003	4.3905	0.356
		6	-0.020	-0.024	4.7986	0.441
		7	0.010	0.007	4.8937	0.558
		8	-0.019	-0.023	5.2661	0.628
		9	0.000	-0.001	5.2662	0.729
		10	-0.001	-0.004	5.2666	0.810
		11	-0.000	-0.001	5.2666	0.873
		12	0.011	0.008	5.3837	0.911
		13	-0.019	-0.018	5.7437	0.928
		14	-0.033	-0.034	6.8265	0.911
		15	0.014	0.012	7.0316	0.933
		16	-0.025	-0.028	7.6634	0.937
		17	0.017	0.015	7.9484	0.950
		18	0.019	0.015	8.3328	0.959
		19	-0.047	-0.046	10.629	0.909
		20	0.024	0.022	11.211	0.917
		21	-0.003	-0.005	11.219	0.940
		22	-0.004	-0.005	11.233	0.958
		23	0.070	0.069	16.205	0.806
		24	0.011	0.014	16.334	0.841
		25	0.077	0.084	22.410	0.555
		26	0.049	0.060	24.891	0.468
		27	0.005	0.019	24.921	0.523
		28	-0.003	0.010	24.929	0.578
		29	-0.052	-0.040	27.702	0.480
		30	0.037	0.039	29.121	0.459
		31	0.005	0.013	29.147	0.510
		32	-0.013	-0.011	29.314	0.553
		33	-0.039	-0.039	30.867	0.524
		34	-0.034	-0.030	32.080	0.513
		35	0.065	0.055	36.535	0.352
		36	-0.023	-0.019	37.087	0.373

c. Uji Heterokadastisitas

Heteroskedasticity Test: ARCH

F-statistic	1.231205	Prob. F(1,999)	0.2674
Obs*R-squared	1.232152	Prob. Chi-Square(1)	0.2670

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 07/28/17 Time: 21:04
Sample (adjusted): 2 1002
Included observations: 1001 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.962787	0.064069	15.02727	0.0000
WGT_RESID^2(-1)	0.035079	0.031614	1.109597	0.2674

R-squared	0.001231	Mean dependent var	0.997759
Adjusted R-squared	0.000231	S.D. dependent var	1.765040
S.E. of regression	1.764836	Akaike info criterion	3.975988
Sum squared resid	3111.531	Schwarz criterion	3.985796
Log likelihood	-1987.982	Hannan-Quinn criter.	3.979716
F-statistic	1.231205	Durbin-Watson stat	2.000495
Prob(F-statistic)	0.267440		

CURRICULUM VITAE

Nama	: Muhammad Safi' Mulhan
Tempat, tanggal lahir	: Purbalingga, 29 Juni 1996
Jenis Kelamin	: Laki-laki
Agama	: Islam
Alamat Asal	: Rt 02 Rw 07 Karang Duren , Baleraksa, Kec. Karang Moncol Kab Purbalingga
Alamat Jogja	: Sapen GK 1 o 454 Rt 26 Rw 08 Demangan, Gondokusuman Kota Yogyakarta
CP	: 082220200460
E-mail	: safikbisa@gmail.com

Riwayat Pendidikan :

1. RA Diponegoro 2 Baleraksa : 2000 - 2001
2. MI Ma'arif NU 02 Baleraksa : 2001 - 2007
3. MTs N Karanganyar, Purbalingga : 2007 - 2010
4. SMA A Wahid Hasyim Tebuireng : 2010 - 2013
5. S1 UIN Sunan Kalijaga Yogyakarta : 2013 – 2017