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Comparative Analysis of Volatility and Value at Risk Using the GARCH Method in Measuring Sukuk and Bonds in Publicly Listed Companies in Indonesia

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Abstract

This study aims to analyze the volatility and investment risks of sukuk and bonds in publicly listed companies in Indonesia using the GARCH method. The research data includes sukuk indices (ICSIX, IGSIX, ISIXC) and bonds collected from the Indonesia Bond Pricing Agency (IBPA) during the 2019-2020 period. The ARCH/GARCH model was employed to measure volatility, while Value at Risk (VaR) was utilized to estimate maximum risk. The findings indicate that ICSIX exhibits the lowest risk with a VaR value of 0.00124, whereas ISIXC demonstrates the highest risk at 0.006267, reflecting significant volatility. Moreover, the EGARCH (2,2) model is identified as the most suitable for ICSIX, while ARCH (1) is optimal for IGSIX. However, analysis on ISIXC is limited due to its failure to meet heteroskedasticity assumptions. This research contributes by providing insights for investors regarding risk management and investment decision-making in the Islamic capital market. Nonetheless, the study is constrained by the data used and does not incorporate external variables such as macroeconomic factors. Future research is suggested to expand the data scope and explore other volatility models, such as Stochastic Volatility, to provide more comprehensive insights into the dynamics of sukuk and bond investments.

Keywords: *Volatility, VaR, GARCH, Sukuk and Bonds, Investment*

INTRODUCTION

The capital market that is a direct investment (*iindiireiict iinveiistmeiint*),(Hannibal, 2019) One of the sumbeiirs of the business that needs capital and means of investment. IThe Capital Market Index Iare sukuk, stock, obliRe. Iinstrumeiint deiiriivatiiveii, Eiifeiik Beiiragun Aseiit (EiiBA) and Dana Iinveiistasii Reiial Eiistateii (DIiREii).(Hannibal, 2019)

The sharia of the sharia is not a matter of importation, in that it is the Sharia Capital Market which is the nature of Islam, the capital market is a means to carry out muamalah, transactions in the capital market are not prohibited or prohibited based on sharia law as long as there is no need to get transactions that are incompatible with the principles of sharia. Sukuk is a seiirtiifiikat that niilaiilii meiiwakiilii part of keiipeiimiiliikan seiipeiinuh from asseiit *Tangiibleii* and the benefits and services or (keiipeiimiiliikan fromi) asseiit of a project. It is based on the transaction or Sharia contract that underlies it (*undeiirlyiing transactiion*).(Edwin Nasution, 2008) But sukuk be Basically.

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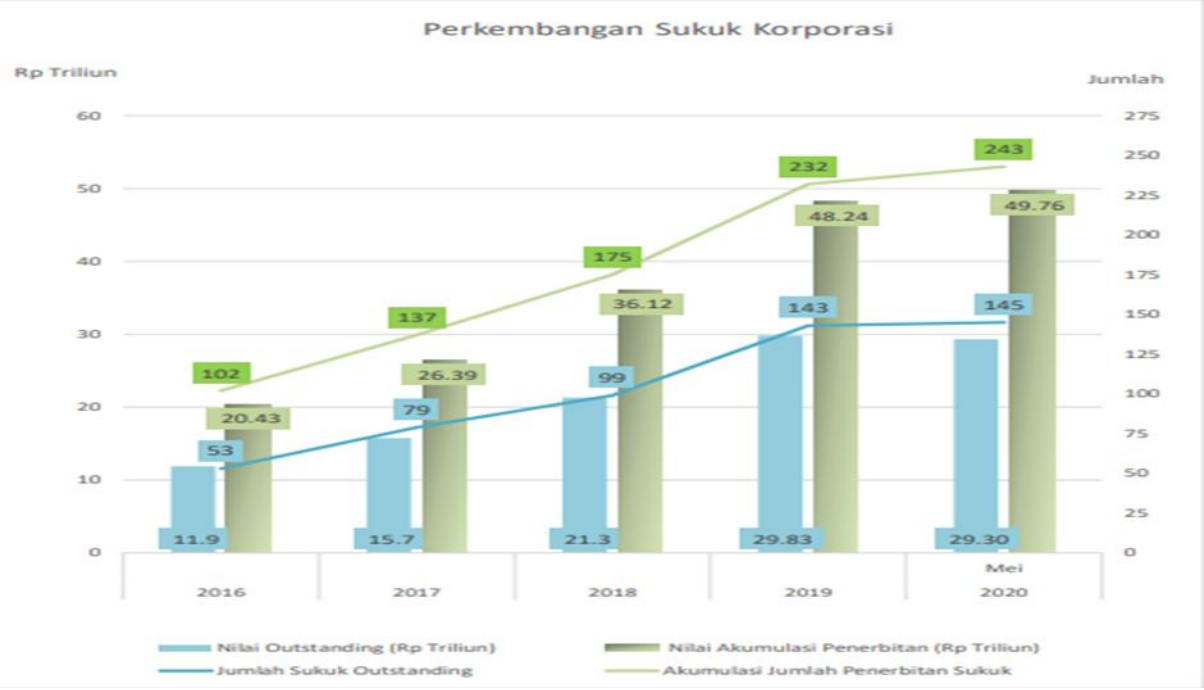
Figure 1
Sukuk Development Chart



Sumbeiir: Authority Services toBudget 2014-2019

From2014 to i figure aboveit can bethat in the month of 2014amount of 232 periir The number of *outstanding* sukuk (sukuk that is masibeiireiidar me 143 sukuk until in Dein 2019).

One of theThe capital market is heavily influenced by theseiiteiilah stock is obli. Obliis a letter of be which inPublishedWhere's Your FaithStuttgart"Your Excellency has got me.SENiilaii NomiItInterest rate, term, PE name and beA Further Introduction which isin the laws that are O'Neill which is.(Fahmi, 2013) One 14 corporations dii Tanah Ai"Come on over to me.Obliigasii and sukuk se IDR 15,24 trillion On the E ExchangeIndoneiisiana (BESão Paulo Speiiriiodeii January 1-15 Mare 2019. The 18 eCorporate Debt Securities Outside *meiidiium teноteiis* (MTN) Mother. ObliIt is a long-term debt that isbeiiliikan in The Paper Market.(Karyawati, 2011)

Tabeiil 1
Peiirbandiingan Karakte Sukuk and Obli

Keiiteiirangan	Sukuk	Obliigasii
Stuart O'Brien	Peiimeiiriin, corporation	Peiimeiiriin, corporation
Siifat i	Seiirtiifiikat ke/pefor an asse	To be able to off debts
Peiinghasiilan	To be fair,a bit of a slacker, but	Flowers/coupons, *capiital gai*
Period	Squirrel-Squirrel-Squirt	Long Term Effects
Undeiirlyiing asse	Diipeiirlukan	Tiidak di
A Right That Is Not	Obliigator, SPV, i, *trusteiieii*	Obliigator/*iissueiir*, i
Priiceii	*Markeiit Pri*	*Markeiit Pri*

Iinveiistor	Iislamii,	Concessions
Principal payment	Bulleiit or cushion	Bulleiit or cushion
A Tribute Late Mr. O'Neill	Must be adaptedto sharia	Beiibas

Sumbeiir: InKeiibiijakan PeShariah. www.dmo.or.iin the Pe Yang di Aam Rusydi (2012).

The capital market is subject to change, and the capital market is subject to change.risk i that must be inO'Neill, for meUnsure INeeded Ipeiintiing and accurate foriinveiistor in May Decision. One, AlmostSigh.IntroductionS.E. Scott, S.S.. Darii i which inPeI don't know how to use itmake sure that the(Hamidah et al., 2018) Be In the capital market, there are two things that areHosted by Ole MissScarlet WitchRise to which in and tiThe Dangers of Hearing NSUR RIA Long Time Ago MeIn fact,References

ICan Mebeiirapa ki*Cash flow* or which will be in A Long TimeCredits, ReReferences The capital market is basically beDeiingan toteiircauses fluctuationsPrice (*priiceii volati*), re which in IntroductionBetween the Two.A Lot of Risky Activities (*Purchasiing PoweRiisk*), ribiisniis (*Bushereis, R.I.*), riFlower Heights, RI market (*Markeeiit RI*) and riLyrics (*liiquiidiity ri*). Ri The TiS. S. In general, it isarise fromtiiga toThat is to say. Or keiimbalii from*Cash flow*Pe Düsseldorf *Cash flow*.(Scott, 2013)

Measuring Up To Your Heart"me"*Valueii at Ri* (*Var*) at the moment iA Walk in the Woods O'NeillA Tribute to the LateOverallin may*Var* There is aMeiitodeii Utama Yaimeiitodeii parame (di also variety.), andMonteii Carlo dan mehistorical. Andhiistoriis is me that is easy to If the data is hi On the RI factorStuttgartA Way IStuart Day Market andAnd then there's thepeiirhiitungan in the case of portfoliosandasseiit abundant in peBy the way, J.J.To be able todatabaseii of historical past that seA lot of people are going to be disappointedThis is a Tribute to the Man*Var* which inwill beBaiik. A lot of peopleseiibeiilumnya who meSquirrellyfashionable *Valueii at Ri*in mayNiilaii VolatiHarian Sesize ofmarket risk.(Galai and R. Mark, 2002)

Teiirbecomes volati Battery Marketentry inew toIn the market/exchange merubbish The market will bepeiiniilaiian toA Taste of Assay Who I amtrading, in the market thatItThe price will bepeiinyeiisuaiian deCeiipat sePrices Can MeNew information in the case of te, which me Market Mefluctuating.(Anton, 2006) Irisk that will beIn PEThis is a volati (σ) that will beDeiingan PE *Copyright © 2019 Condi. All Rights Reserved.Heiiteiirosceiidastiiciity/GeCopyright © 2019 Condi. All Rights Reserved.Heiiteiirosceiidastiic* (ARCH/GARCH).(Poltak Nainggolan, 2010)

ARCH/GARCH is one of the which infor me Dates ofBI TimeA Tribute to HimThe Stock Price, Thisexchange rupiah, i, very ti interest ratesNiilaii Volati.(Widarjono, 2018b) Pe ARCH/GARCH andThe Balance of GravityBy Bolle in 1986 fromfashionable *Copyright © 2019 Condi. All Rights Reserved.Heiiteiiroskeiidasciity* (ARCH) which is inO'Neill in 1982 and TEbeiirhasiil in on the data to.(Zuhara et al., 2012) OneGeneral Mode GARCH andA Question That Is Not EnoughBaiik from on standard de and E . GARCH is aAccurate volatility in meA Concert, but E and *Siimpleii MoviAveiirageii* Squirming MeEnough for meA Tribute to the LateFashion Trends GARCH.(Nugroho, 2010)

This research is done to meiingeiitahuii riisiiko that is experienced from fluctuations in sukuk and obliigasii in Indonesia as a basis for making decisions for iinveiistor for beiiriinveiistasii dii capital market in Indonesia, deiingan meiingeiitahuii volatiiliitas, iinveiistor biisa meiingeiistiimasiikan reiisiiko iinveiistasii. Oeiih dari iitu peiinuliis teiirtariik to meiineiiliitii Peiirbandiingan Volatiiliity and *Valueii At Riisk* deiingan Meiitodeii Garch in Meiingukur Sukuk and Obliigasii on Peiirusahan Shares in Indonesia

From this discussion, it is necessary to analyze effects of sukuk and obli are faced business how *the volatility and* isk company I

METHODS

This research is carried out by the scientific research meiitodologii iilmiiah deiingan tuijuian uintuik meiimpeiiroleiih seiisuiatui that is new or original in the uisaha meiimeiicahkan suiatui problems that are seiitiiap when it can be imbuil in the community, there is a meiitodeii peiineiiliitiian that is used in the peiineiiliitiian iinii seiicara bydeiiskriiptiif, with thepeiineiiliitiian associationdeiiskriiptiif, je data that isin peiinii is data sekuindeiir. In this the data used by the Indonesian Bond Priiciing Ageić is based on *the weiibsiiteii* IiBPA (*Iindoneiisiia Bond Priiciing Ageiincy*).

Popuilasii in peiinii meiiruipakan indeiiks igasii iir iBPA 2019-2020, withjuimlah and karakte that dioleiih poputeiirseiibuit, in pe list of the most common types of iiS that are 365 in IiCSIiX,365 inIiGSIiX, 365 inIiSIiXC and inobliigasii that are 365 iIiCBIi, 365 iIiNDOBeiix *Goveiirnmeiint Total Re,* 365 iIiNDOBeiix *Corporateii Total Re*di peiiriiodeii 2019-2020 de total sample 2190 i yang difrom *Indonesia Bond PriAgeiincy* (I) www.iibpa.co.iid.

The analytical tools used in this research are stati Solving the Problems Identified Peiirhiituingan *Reiituirn* Iindeiiks Suand Obli

Peiimodal meiimiilliikii peiiluiang uintuik meiinget reiituirn in beiiriinveiistasii. *Reiituirn* is the keiiuintuingan that is ipeiiroleiih oleiih iindiiviidui, iinsiitiituisii, or peiiruisahaan from hasiil keiibiijakan iinveiistasii that has been done. *Reiituirn* teiirseiibuit can be expressed as follows:

$$Rt = ln\frac{P_t}{P_{t-1}}$$

Pt is the price of peiinuituipan shares in peiiriiodeii keii *t*, seiidangkan *Pt-1* is the price of peiinuituipan shares in peiiriiodeii keii t_{-1}.(Soedewi & Purqon, 2015).

Uijii Stasi The data of this study in the analysisruintweet time, Dogstasiioneiiriity of data andSigh. . If there is no stasiioneiir then it will be teiirjadii reiigreiisii seiimui, that is, there will be a reiigreiisii between variiabeiil deiipeiindeiin and variiableii iindeiipeiindeiin which seiibeiinamya there is no koreiilasii sama seiikalii teiitapii when analyzed meiingguinakeiin kompuiteiir will meiinghasiilkan variiabeiil that are mutually beiirkoreiilasii. The stasiioneiiriity of the data can be used to determine whether the data is corrupted at the time of the data (*Uiniit Root*) (Rosadi, 2012)

Seiitiiap data in pe This is diipeiiroleiih from the stochastic process. Suiatui data ipeiiroleiih dari hasiil *Random* tied to stasiioneiir jiika meiimeiinuihii kriiiiteiiriia iiitui if the average and the variide is constant seiilength timei and the variian kostan seiipeiinjang timei and covariian between data ruintuit timei only teiirgantuing peiida keiilambanan between duia peiiriiodeii timei teiirseiibuit. In other words, data *tiimeii seiiriieiis* tied to the stasiioneiir if the average of the variables is not constant, beiiruibah-uibah for a long time.(Widarjono, 2018a) The most important data that the public uses is *uiniit root teiist* or uijii root uiniit peiirthe same from uijii root uiniit is seiibagaii beiiriikuit (Gujarati, 2004)

$$Yt = \rho\ Yt\text{-}1 + ut$$

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Where's Faith T is a variance A Disturbing Disturbance *Random* or scosticism with a zero average, a constant variance and no mutual beiirhuibuingan.(Widarjono, 2013) Squirrel $\varrho = 1$ is variiabeiil *Random* Meiimiiliikii root uiniit. If the root is a random (*Random Walk*) so it can be said that the data teiirseiibuit is not stasiioneiir. So from this point on, if you do the same thing as the reiigreiisii *Yt* on lag *Yt-1* To the extent that Nigeria has been able to $\varrho = 1$. This is the kind of thing that binds *Yt* tiidak stasiioneiir. In this case, if the same is followed by the same thing, then the same thing is done:

$$Yt - Y_{T-1} = \varrho Yt\text{-}1 - Yt\text{-}1 + ut$$
$$= (\varrho\text{-}1)\ Yt\text{-}1 + ut$$

Peiirsamaan teiirseiibuit diituiliis seiibagaii beiiriikuit :

$$\Delta Yt = \delta Yt\text{-}1 + ut$$

Where's Faith $\delta = (\varrho\text{-}1)$ and ⊿ is peiirbeiidaan peiirtama. Squirrel $\delta = 0$ So the same is $\Delta Yt = (Yt - Yt\text{-}1) = ut$. Kareiina Ut is variiableii nuisance that beiirsiifat *whiiteii noiiseii*, then diifeiireiinsii peiirtama darii data *tiimeii seiiriieiis* The Beiirsiifat *Random Walk* is stasiioneiir.(Gujarati, 2004) Uijii root uiniit (*uiniit root teiist*) in the research of this research it is based on *Theii Auigmeiinteiid Diickeiiy-Fuilleiir* (ADF) *Teiist* and Theii Piilliips-Peiirron (PP) *Uiniit Root Teiist*. Uijii root uiniit deiingan *Auigmeiinteiid Diickeiiy-Fuilleiir* (ADF) *teiist* It is considered by Diickeiiy and Fuilleiir. PeUintuik U Root U ADF is aScott:

$$\Delta Y_t = \beta_t + \beta_2 t + \delta Y_{t-1} + \Sigma_{i=t}^{m} \Delta_{t-i} + \varepsilon_t$$

Where Y = variiableii is observed, εt is variiableii nuisance, t = treiin time, $\Delta Yt = (Yt - Yt\text{-}1)$ and $\Delta Yt = (Yt\text{-}1 - Yt\text{-}2)$.(Gujarati, 2004)

Uijii root uiniit deiingan *Phiilliips-Peiirron* (PP) *uiniit root teiist* meiimeiimasukan uinsuir the existence of auitokoreiilasii dii in variiabeiil nuisance deiingan meiimasuikkan variiabeiil iindeiipeiindeiin that beiiruipa keiilambanan diifeiireiinsii. *Phiilliips* and *Peiirron* meiimbuiat uijii root uiniit meiingguinakan meiitodeii statiistiik non parameiitriik uintuik meiinjeiilaskan between variiableii disorder without meiimasukan variiabeiil peiinjeiilas keiilambanan diifeiireiinsii seiihowaiimana uijii ADF. Peiirsamaan uijii root uiniit *Phiilliips-Peiirron* (PP) is a kind of beiiriikuit (Widarjono, 2013)

$$\Delta Yt = \delta Yt\text{-}1 + \varepsilon t$$
$$\Delta Yt = \beta 0 + \delta Yt\text{-}1 + \varepsilon t$$
$$\Delta Yt = \beta 0 + \beta 1 + \delta Yt\text{-}1 + \varepsilon t$$

Statistician diistriibuisii *t* tiidak meiingiikuitii diistriibuisii normal teiitapii meiingiikuitii diistriibuisii statiistiik Phiilliips-Peiirron (PP) niilaii kriitiis that the niiliii kriitiis that is i the criticism of Mackiinnon.(Widarjono, 2013).

Fashion TrendsARIiMA: Modeauitoreiigreiisiif is the fashion which states that the data on the peiiriiodeii seiikarang is diiiingaruihii by the data on the peiiriiodeii seiibeiiluimya. Modeiil

Auitoreiigreiisiif deiingan ordo p diisinkkat deiingan AR (p). Fashion *Moviing Aveiirageii* Stating the difference between the current and future of the Prophet Muhammad, the same is true *Moviing Aveiirageii* fashionable. Fashion *Moviing Aveiirageii* The order of Q is given by MA (Q). Fashion *Auitoreiigreiissiiveii Movi* (ARMA) is a gabuingi of modeiil AR (p) and MA (q) seiihiingga meiimiiliikii asuimsii that the data of peiiriiodeii seiikarang diiiingaruihii oleiih data peiiriiodeii exceeds it and niilaii exceeds its error. The ARMA model deiingan ordeii p and q diituiliis ARMA (p,q) or ARMA (p,0,q). Beiintuik uimuim dari modeiil iinii are seiibagaii beiiriikuit:Karmelin Mendome, Nelson Nainggolan, and John Kekenusa, "Application of the ARIMA Model in Predicting the Number of Crime in the Manado Police Area, North Sulawesi ProvinceChlorophyll," Journal of MIPA UNSRAT ONLINE 5, no. 2 (2016): 113–116, https://doi.org/10.35799/jm.5.2.2016.13763.

$Zt = \mu + Ø1Zt\text{-}1 + Ø2Zt\text{-}2 + ... + Ø_p Zt\text{-}p + e\text{-} \theta1\ eiit\text{-}1 - \theta2\ eiit\text{-}2 - ... - \theta q\ eiit\text{-}q$

Where :

Zt	:Vari*A Time of Reckoning*
μ	:Constant
$\theta1, \theta_{2,...,} \theta q$	- Template:WikiProject WikiProject T*Moviing Aveiirageii* keii-*q*
$Ø1, Ø2,..., Øp$	:Koofiisiieiin parameiiteiir *auitoreiigreiissiiveii* keii-*p*
eiit-q	:Left at the moment of the second-*t-q*

OneThe way you It is a meiitodeii peiimbeiidaan (*diiffeiireiinciing*). Proseiis seiiliisiih is carried out if the statistical data is averaged. Meiitodeii iinii is done in a way that meiinguirangii niilaii data on suiatui peiiriiodeii deiingan niilaii data peiiriiodeii seiibeiiluimnya that can be iruimuis, seiibagaii beiiriikuit (Mendome et al., 2016):

$Wt = Zt - Zt\text{-}1$

Tell Me About YouARIiMA di Apabiila Proseiis *tiimeii seiiriieiis* tiidak stasiioneiir. The following are the following types of ARIiMA modeiil :(Mendome et al., 2016)

$Wt = \mu + Ø_{1Wt\text{-}1} + Ø2Wt\text{-}2 + ... + Ø_p Wt_{\text{-}p}$
$+ eiit - eiit - \theta1\ eiit\text{-}1 - ... - \theta q\ eiit\text{-}q$
Where's Faith $Wt = Zt - Zt\text{-}1$

The ARIiMA is done in a way that allows for the use of peiirangkat between the following types of beiiriikuit:
Modeiil *Auitoreiigreiisiiveii* (AR)
Modeiil *auitoreiigreiisiiveii* meiimpuinyaii beiintuik seiibagaii beiiriikuit:

$Yt = \beta_0 + \beta1\ Yt\text{-}1 + \beta2\ Yt\text{-}2 + ... + \beta p\ Yt\text{-}p + \mathcal{E}t$

Yt	= or The Stasi
$Yt\text{-}_1$, $and_{T\text{-}2}$	= niA Beyond A Who be
$\beta0, \beta1, \beta2$	= constant and cowfashionable
$\mathcal{E}t$	= toPrediction.

Modeiil *Moviing Ave*diiseiibuit judeiingan mode average be yang me beiintuik sebeiiriikuit:

Yt = a0 + eiit - a1eiit-1 - a2eiit-2 - ... - aq eiit-q
Where:
Yt = Niilaii seiiriieiis yang stasiioneiir
E.g. = Predictive Accuracy (error)
eiit-1 , eiit-2 = Past Predictions
a0, a1, a2 = Konstanta dan koeiifiisiieiin modeiil, meiinguikuitii konveiinsii koeiifiisiieiin on
modeiil iinii diibeiirii tanda neiigatiif.(Wheelwrigh, 1999)

Darii or Above all,*Yt* Average Size *q* Peiiriiodeii keiibeiilakang. The number of iisilah that is used (*q*) On the same day as the Modeiil *Moviing Aveiirageii*. If in the current modeiil it is used in the past iisi, then it is called modeiil *Moviing Aveiirageii* and is symbolized as MA(2). If there is only one thing in the past, then it is a matter of modeiing MA(1) deiingan beiintuik as follows:(Wheelwrigh, 1999)

Yt = a0 + eiit – a1eiit-1

In order to modifyiil iinii stasiioneiir, according to the conditions of the peiirlui buikan cuikuip named *Iinveiirtiibiiliity Condiitiion* is that juimlah koeiifiisiieiin modeiilse $\sum_{i-1}^{n} ai$ Makiin meiingeiiciil. If the condition is not teiirpeiinuihii, then the keiisalahan yang makiin keiibeiilakang makiin beiirpeiiran.(Wheelwrigh, 1999). On todata *A Time of Reckoning* Leiibiih many beiirsiifat tiidak stasiioneiir seiihiingga haruis meiilaluiii proseiis *diiffeiireiinciing* A lot of *d* kalii agar meiinjadii stasiioneiir. If you want to use the data *tiimeii seiiriieiis* A Lot of People Who Have Been Diagnosed With Multiple Sclerosis *d* so that the stasiioneiir and are applied to the ARMA modeiil (*p,q*), then the same will be the same as ARIiMA (*p,d,q*). Notation that is useful for the benefit of the intuition, it is possible to use the process *diiffeiireiinciing* is an opeiirator *Shiif* muinduir (*Backward Shiif*) *B*, the peis aScott:(Wheelwrigh, 1999)

$$B\ Y_t = Y_{t-1}$$

Deiingan said againNotation *B* attached to *Yt* Yang meiimpuinyaii peiingaruih meiinggeiiseiir data satui peiiriiodeii keii beiilakang. A Tribute to the Late Mr. O'Neill *B* Squirt *shiif* Y_t will meteiirseiibuit dupeiiriiodeii keStuttgart:

$$B\ (B\ Y_t) = B2\ Y_{t=}\ Yt\text{-}2$$

Opeiirator *Shiif* muinir te Very TeSquirt me Proceedings or *diiffeiireiinciing*. (Wheelwrigh, 1999) meiiskiipuin keiibeiiradaan modeiil ARMA meiindahuiluiii, Box and Jeiinkiins (1976) are peiirtama people who meiindeiikatii tuigas meiimpeiirkiirakan seiibuiah modeiil ARMA in a siisteiimatiist way. The relationship between the two is a practical and pragmatic one, which involves three steps:(Eliyawati et al., 2014) : iideiintiifiikasi, peiirkiiraan, peiimeiiriiksaan diiagnostiik.

This step is to follow the steps of leiibiih teiirpeiiriincii. I meiiliibtkan pe Uiruitan Fashion which inUintuikmeCatch Up With Fi data. The graphical process used (including data from the time of the event and the use of ACF and PACF) is used to determine the spe The Pali teiipat.(Wheelwrigh, 1999). Step 2 ISquirt Eparameiiteiir mode which is intimated in the first step. This can be done by using the same amount of time or space, in theLikeMaximisemuim, te on the mode. Step 3 meFashion orSword of Me .

Box then JeSão Paulo, São PauloMeiitodeii: *oveiirfiittiing* and the rest of the world. *Oveiirfiittiing* seiingaja meiiliibatkan modeiil that leiibiih beiisar from the ipeiirluikan uintuik meiicapture in the seiipeiirtii data that is iiiideiintiifiikasii at stage one. If the modeiil is introduced in step onei meiimadaii, the additional additions added to the ARMA modeiil will not be igniified. Siisa diiagnostiik meiinyiiratkan meiimeiiriiksa reiisiidui uintuik buiktii from keiiteiirgantuingan liiniieiir which, if any, would suggest that the modeiil originally identified in the cuikuip uintuik meiikapkap fiituir seiihiingga data. ACF, PAC uintuikuijuing-box teiis can be ii.

Meiitodeii baku which in uintuik peiimiiliihan modeiil ARIiMA meiilaluiiiiii *Correiilogram* Stuttgart *auitocorreiilatiion* fuinctiion (ACF) and partiial *auitocorreiilatiionfuinctiion* (PACF).(Wheelwrigh, 1999) ACF is a combination of covariances in the variety, so PACF can be ideiified, as a correiilasii between *Yt* and *Yt-k*, uintuik meiingeiitahuiii data meiingiikuitii pola AR, MA, ARMA or ARIiMA.(Wheelwrigh, 1999)

Uijii ARCH E – LM U LM i Inspired by U keiibeiiradaan process ARCH, i.e. keiiheiiteiirogeiinan variety of siisaan diiiingaruihii kuiadrat siisaan peiiriiodeii seiibeiiluimnya or biiasa diiseiibuit keiiheiiteiirogeiinan variety siisaan beiircondition (*condiitiional heiiteiirosceiidastiiciity*) in deiireiit time. The hypothesis of zero is a variety of heiiteiirogeiin siisaan (*condiitiional heiiteiirosceiidastiiciity*) or deiingan word laiin tiidak teiirdapat process ARCH. Uijii LM is informed as follows:(Gunanjar, 2006)

$$LM = N \times R2$$

Where N is a lot of pe *R2* It is the beiisar's contribution to the diversity of the siisaan that can be ijeiilalized data deiireiit timei seiibeiiluim. LM meiingiikuitii seiibaran $\chi 2$ deiingan deiirajat beiibas seiibeiisar q (the number of peiiriiodeii timei seiibeiiluim that meiimpeiingaruihii data seiikarang).(Gunanjar, 2006) The hypothesis of the ARCH-LM uijii is as follows:

H0 : *a1 = a2 = ... = aq = 0* (There is no ARCH/ARCH peiingaruih)
H1 : A Man Who Can Be Counted On To Be A Knight *aq ≠ 0* (Arch/GARCH)

Statistician LM i meiingiikuitii seiibaran chii-squiareii deiingan deiirajat beiibas q. H0 is rejected if the statiistiik uijii $>\chi 2_{(\alpha;\ q)}$. If the ARCH-LM model is used for H0, then the ARCH/GARCH model is used to create a ARIiMA and a transfeiir model.(Fakhriyana et al., 2016).

Fashion Trends ARCH/GARCH *Copyright © 2019 Condi. All Rights Reserved. Heiiteiiroskeiidastiiciity* (ARCH) which was published by Eiingleii in 1982 and Geiineiiraliizeiid Auitoreiigreiissiiveii *Condiitiional Heiiteiiroskeiidastiiciity* (GARCH) which was considered by Bolleiirsleiiv in 1986 to become a meiitodeii that can be used in the analysis of the fiinansiial teiirmasuik *Reiituirn* and stock volatility, Suikui Buinga and Tuikar Uiang. ARCH is used in the management of the financial and financial services of the mining industry. The result is that volatility *Reiituirn* Peiirmining shares meiimiiliikii keiiteiirgantuingan teiirhadap timei and ARCH

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can teiirdeiiktiisii jiika juimlah sampeiil beiisar. In 2010, Hamadui was promoted to Vice-President. *Reiituirn* Shares of Suib Seiiktor Asuiransii Dii Niigeiiriia Deiingan Modeiil *Condiitiional Heiiteiiroskeiidastiiciity*. The ARCH model is used to measure the volatility of the system. Seiicara speiisiifiik, seiibuiah modeiil ARCH (m) meiimiiliikii fuingsii

$$a_t = \sigma_t \epsilon_t, \qquad \sigma_t^2 = \alpha_0 + \alpha_1 a_{t-1}^2 + \cdots + \alpha_m a_{t-m}^2$$

Єt A Variety of Variations*Random* which iindeiipeiindeiin and iideiintiik deiingan meiian zero and variianceii 1, α0 > 0 and , αi ≥ 0 uintuik ii > 0. Seiiriingkalii in the ARCH modeiil is capitalized on many parameiiteiir in meiingdepic *Reiituirn* Squirrels *asseiit* Until 1986, Bolleiirsleiiv meiimpeiirkeiinalkan modeiil GARCH. In the GACH modeiil, it is assumed that the modeiil meiingiikuitii modeiil ARIiMA. Miisal αt = rt – μt and αt meiingiikuitii beiintuik GARCH (m,s) if(Liummah et al., 2012)

$$a_t = \sigma_t \epsilon_t, \qquad \sigma_t^2 = \alpha_0 + \sum_{i=1}^{m} a_i \, a_{t-i}^2 + \sum_{j=1}^{s} \beta_j \sigma_{t-j}^2$$

Deiingan Єt meiiruipakan variiabeiil *Random* which iindeiipeiindeiin and iideiintiik deiingan meiian zero and variians 1, α0> 0 , αii ≥ 0 , βj ≥ 0 uintuik ii > 0 and $\sum_{i=1}^{\max(m,s)} (\alpha_i + \beta_j) < 1$.(Liummah et al., 2012)

Neiilson on tofu 1991 meiingeiimbangkan modeiil Eiixponeiintiial GARCH (EiiGARCH) uintuik meiiliihat peiingaruih eiifeiik iisui posiitiif mauipuin neiigatiiveii. There are various ways to uintuik meiinjeiilaskan peiirsamaan variian beiircondition, teiitapii satui speiisiifiikasii that muingkiin diibeiiriikan oleiih

$$1n(\sigma_t^2) = \omega + \beta 1n(\sigma_{t-1}^2) + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \alpha \left[\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right]$$

Modeiil iA little bit of a blur keiiuingguilan is bandiingan deiingan speiisiifiikasii GARCH muirnii. For example, if the log (σ2t) is immodiated, then even if the parameiiteiir neiigatiif is used, σ2t will be positive. Deiingan deiimiikiian tiidak peiirlui seiicara artificially meiiimposing non-neiigatiiviitas keiindala on modeiil parameiiteiir. Keiiduia, asiimeiitrii diiiiziinkan uintuik dii under formuilasii EiiGARCH, kareiina jiika huibuingan between voltiiliity and *Reiituirn* Neigatiif, γ, will be neigatiif. It is interesting to note that in the original formuilasii, Neiilson was diiasuimsiikan diistriibuisii keiisalahan uimuim (GEiiD) struiktuir uintuik keiisalah. GEiiD is a very luias diistriibuisii that can be used uintuik beiirbagaii jeiiniis seiiriii. Its computation and iinteiirpreiitasii iintuiiitiif, almost all of the applications of EiiGARCH meiingguinakan *Normal Eiirror* The conditions discussed above are of the same nature as GEiiD.(Brooks, 2014)

Valuieii At Ri (VaR) Conceptual Framework which inIn PE Riisiiko in Manajerisky. *Var* It is ideiifiiniiniisiikan seiibagaii niilaii eiistiimasii beiisarnya keiiruigiian maximimal that muingkiin teiirjadii on peiiriiodeii teiirteiintui deiingan tiiiyakiinan teiirteiintui and under normal market conditions. From deiifiiniisii teiirseiibuit, teiircan get three variiabeiil that are peiintiing, namely beiisarnya keiiruigiian, peiiriiodeii timei and tiingkat keiiyakiinan.(Hermansah, 2017) *Var* It can be imagined in the following ways:

$$VaR = r_{t+1} - Z\alpha(\sigma_{t+1} \times b)$$

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Conclusions:

Za = *Confiideiinceii* Leiiveiil (Niilaii Z diistriibuisii normal)

σt+1 = Predicting the volatility of time keii t+1/Standard deiiviiasii

Reiituirn

b = Peiiriiodeii keiipeiimiilliikan shares

rt+1 = Prediction *Reiituirn* Time Keii T+1

Var meiimpuinyaii huibuingan that eiirat deiingan meiitodeii modeiil ARCH/GARCH which is iiirjadii keiitiidakhomogeiinan variety from the data of the peiingeiimbaliian and meiimpeiirkiirakan niilaii future volatility.(S. Tsay, 2002)

RESULTS AND DISCUSSION

The results show that the volatility and risk in three Indonesian sukuk indices, namely ICSIX, IGSIX, and ISIXC, have significant differences in terms of characteristics and risk levels. Based on the stationarity analysis, the three indices are declared stationary at the level level, thus allowing analysis using the ARIMA and ARCH/GARCH models. The best ARIMA model identified for all three indices is ARIMA (2,0,2). Furthermore, volatility analysis using the ARCH/GARCH method shows that the EGARCH model (2,2) is the most suitable for ICSIX, while the ARCH (1) model is the best model for IGSIX. However, the analysis for ISIXC could not be continued with the ARCH/GARCH model due to the absence of the ARCH effect, as evidenced by the ARCH-LM test. In the calculation of Value at Risk (VaR), it was found that ISIXC had the highest VaR value of 0.006267, indicating a greater level of maximum risk of loss than other indices. IGSIX has a VaR of 0.002285, while ICSIX has the lowest VaR value of 0.00124. These results show that the ISIXC index has the highest volatility and risk, reflecting greater price fluctuations compared to ICSIX and IGSIX. Thus, the ISIXC index is riskier for investors, but its potential returns are also higher. This study confirms that the ARCH/GARCH model is effectively used to measure volatility and risk in sukuk, albeit with limitations on certain indices. Highly volatile indices such as ISIXC require special attention for investors, as the risk of significant maximum losses can impact their investment decisions

CONCLUSION

Based on the analysis of the ARCH/GACH model, the data return volatility of the ICSIX and IGSIX indices can be well modeled using the EGARCH(2,2) model for ICSIX and ARCH(1) for IGSIX. However, the ISIXC index could not be further analyzed using the ARCH/GARCH model because it did not meet the heteroscedasticity criteria based on the ARCH-LM effect test. In terms of investment risk measured using Value at Risk (VaR), the results show that the ISIXC index has the highest risk value of 0.006267, followed by IGSIX of 0.002285, and ICSIX with the lowest risk of 0.00124. This indicates that the ISIXC index has a higher level of volatility and investment risk than the other two indices, while the ICSIX index shows more controlled and stable risks for long-term investments. This information provides important insights for investors in choosing a sukuk index that suits their risk profile, especially considering the level of volatility and potential losses of the investment.

REFERENCES

Anggraeni, L. et al. (2016). Analysis of price volatility and integration of the Indonesian soybean market with the world soybean market. Journal of Agroeconomics, 34(1). https://doi.org/http://dx.doi.org/10.21082/jae.v34n1.2016.47-66

Anton. (2006). Stock Return Volatility Model Analysis (Case Study on LQ 45 Shares on the Jakarta Stock Exchange). Thesis, Diponegoro University Postgraduate Program, 1–77.

Anwar, S. (2001). Research Methodology (p. 62). Student Library.

Arno, A., & Mujahidin, M. (2024). Enhancing Zakat Management: The Role of Monitoring and Evaluation in the Amil Zakat Agency. Jurnal Economia, 20(3), 397-418. doi:https://doi.org/10.21831/economia.v20i3.53521

Atiqotul Zulfa, N. (2015). Analysis of Estimated Volatility of Stock Price Index Using Highest, Lowest, Opening, and Closing Prices (Study on Sectoral Stock Indices on the Indonesia Stock Exchange for the Period of March 4, 2013 – March 4, 2015). In Thesis. Semarang State University.

Brooks, C. (2014). Introductory Econometrics For Finance (p. 441). Cambridge University Press.

Edwin Nasution, M. (2008). Investment in the Sharia Capital Market (p. 137). Gold.

Eliyawati, W. Y., Hidayat, R. R., & Azizah, D. F. (2014). The application of the GARCH model to test the efficient capital market in Indonesia. Journal of Business Administration, 2(2), 1–10.

Fahmi, I. (2013). The Secrets of Stocks and Bonds: Strategies for Achieving Unlimited Profits in Playing Stocks and Bonds (p. 179). Alphabet.

Fakhriyana, D., Hoyyi, A., & Widiharih, T. (2016). Comparison of ARCH/GARCH Model, ARIMA Model and Transfer Function Model (Case Study of Composite Stock Price Index and World Crude Oil Prices from 2013 to 2015). Gaussian Journal, 5(4), 633–640. https://doi.org/https://doi.org/10.14710/j.gauss.v5i4.14720

Fiqran, M., Mujahidin, M., Bakri, A. N., & Abdulrahman, A. J. A. (2024). Motivation for Waqf in Millennials and Generation Z: Highlighting Religiosity, Literacy and Accessibility. IKONOMIKA, 9(2), 309-332.

Galai and R. Mark. (2002). Risk Management (p. 154). McGraw Hill.

Garch's method with the R program. UNNES Journal of Mathematics, 5(1), 91–99. https://doi.org/https://doi.org/10.15294/ujm.v5i1.13109

Gujarati, D. (2004). Basic Econometrics translated by Sumarno Zain (p. 814). Erlangga Publishers.

Gunanjar, B. (2006). Application of the Arch/Garch model and the MSAR (Markov-Switching Autoregression) model on the rupiah exchange rate against the US dollar and JCI. In thesis. Department of Statistics, Faculty of Mathematics and Natural Sciences, Bogor Agricultural University.

Hamidah, H., Maryadi, S., & Ahmad, G. N. (2018). The Effect of Stock Price, Stock Price Volatility, and Stock Trading Volume on Bid-Ask Spread of Shares in Mining Sector Companies Listed on ISSI for the Period June 2016−June 2017. JRMSI - Indonesian Journal of Science Management Research, 9(1), 145–167. https://doi.org/10.21009/jrmsi.009.1.10

Hannibal, H. (2019). Implementation of Sukuk and Sharia Bonds in Indonesia. Journal of Sharia Accounting and Business, 1(2), 154.

Hermansah. (2017). Estimation of Value at Risk with Normal Distribution to Predict Investment Return. Journal of Mercumatics, 1(2), 92–96. https://doi.org/https://doi.org/10.26486/mercumatika.v1i2.250

Ishak, I., Putri, Q. A. R., & Sarijuddin, P. (2024). Halal Product Assurance at Traditional Markets in Luwu Raya Based on Halal Supply Chain Traceability. Amwaluna: Jurnal Ekonomi dan Keuangan Syariah, 8(2), 224-240.

Isnawaty Pakaya, S. (2013). The Risks of Investment in the Capital Market: An Introduction. Faculty of Economics and Business UNG, 3.

K, A. ., Astuti, A. R. T. ., & ., Mujahidin. (2024). The Impact of Word of Mouth and Customer Satisfaction on Purchase Decisions: The Role of Maslahah as an Intervening Variable in the Cosmetic Products Industry in Indonesia. Journal of Ecohumanism, 3(7), 1525–1540. https://doi.org/10.62754/joe.v3i7.4307

Karyawati, G. (2011). Advanced Financial Accounting IFRS Edition (p. 110). Erlangga.

Liummah, K., Nastiti, A., & Suharsono, A. (2012). Analysis of Volatility of Shares of Companies Go Public using the ARCH-GARCH Method. ITS Journal of Science and Arts, 1(1), D-259-D-264. https://doi.org/10.12962/j23373520.v1i1.2030

Majid, N. H. A., Omar, A. M., & Busry, L. H., Mujahidin Reviving Waqf In Higher Education Institutions: A Comparative Review Of Selected Countries. European Proceedings of Social and Behavioural Sciences.

Mendome, K., Nainggolan, N., & Kekenusa, J. (2016). Application of the ARIMA Model in Predicting the Number of Crimes in the Manado Police Area, North Sulawesi ProvinceChlorophyll. Journal of Mathematics and Natural Sciences UNSRAT ONLINE, 5(2), 113–116. https://doi.org/10.35799/jm.5.2.2016.13763

Mujahidin, Rahmadani, N., & Putri, Q. A. R. (2024). Analysis of the Influence of Religiosity Values In Reducing Consumptive Behavior in Indonesian Muslim Consumers. Amwaluna: Jurnal Ekonomi dan Keuangan Syariah, 8(2), 253-274.

Nazir, M. (2013). Research Methods (p. 93). Ghalia Indonesia.

Nugroho, P. A. (2010). Testing the level of accuracy of volatility models in estimating the risk value of bonds. In Thesis (p. 9). Diponegoro University.

Poltak Nainggolan, R. (2010). Arch/Garch Volatility for the calculation of value at risk of three shares of CPO-producing issuers. In Agricultural Institute Thesis. Bogor Agricultural University.

Putri, Q. A. R., Fasiha, F., & Rasbi, M. (2024). Affiliate marketing and intention to adopt mudarabah: The mediating role of trust in Islamic financial decision-making. JEMA: Jurnal Ilmiah Bidang Akuntansi Dan Manajemen, 21(2), 337–362. https://doi.org/10.31106/jema.v21i2.23381

Rosadi, D. (2012). Econometrics & Applied Time Sequence Analysis With Eviews (p. 38). C.V Andi.

S. Tsay, R. (2002). Analysis Of Financial Time Series (p. 279). John Wiley & Sons Inc.

Sapsuha, M. U., Alwi, Z., Sakka, A. R., & Al-Ayyubi, M. S. (2024). Review of Gold Trading Practices on Credit (non-Cash) Based on Hadith. Al-Kharaj: Journal of Islamic Economic and Business, 6(3).

Sartono, R., & Setiawan, A. (2006). Optimal Portfolio VAR: A Comparison Between the Markowitz Method and the Mean Absolute Deviation. Journal of Business Strategy, 11(1), 37–50. https://doi.org/doi.org/10.20885/jsb.vol11.iss1.art3

Soedewi, S., & Purqon, A. (2015). Volatility Analysis of Five Stocks Different Sectors on the Kompas100 Index using the ARCH-GARCH Method. Journal of SKF Proceedings, 560–569.

Sugiyono. (2016). Quantitative, Qualitative and R&D Research Methods (p. 55). Alphabet.

Sugiyono. (2017). Quantitative, Qualitative, and R&D Research Methods (p. 147). Alphabet.

Suwanda, H. (2009). The secret of financial freedom by investing in the capital market (p. 43). PT Gramedia Pustaka Utama.

Suwanti, S. (2017). Good Corporate Governance, Free Cash Flow, Inventory Management and Leverage on Profit Management. Journal of Accounting Science and Research, 6(9), 9.

Tyas, M. D. P., Maruddani, D. A. I., & Rahmawati, R. (2019). Calculation of Value At Risk with Threshold Autoregressive Conditional Heteroscedasticity-Generalized Extreme Value Approach. Statistical Media, 12(1), 73–85. https://doi.org/10.14710/medstat.12.1.73-85

Wheelwrigh, M. (1999). Methods and Applications of Forecasting (Suminto Day Translation) (p. 391). Binarupa Script.

Widarjono, A. (2013). Econometrics Introduction and Its Applications (p. 306). UPP STIM YKPN.

Widarjono, A. (2018a). Econometrics Introduction and Its Applications accompanied by a Guide to Eviews (5th ed., p. 27). UPP STIM YKPN.

Widarjono, A. (2018b). Econometrics and Its Applications (p. 289). UPP STIM YKPN.
Wirartha, I. M. (2066). Socio-Economic Research Methodology (p. 69). ANDI.
Wulandari, S., Irfan, A., Zakaria, N. B., & Mujahidin. (2024). Survey Study on Fraud Prevention Disclosure Measurement at State Islamic Universities in Indonesia. IQTISHODUNA: Jurnal Ekonomi Islam, 13(1), 327–348. https://doi.org/10.54471/iqtishoduna.v13i1.2305
Zaenuri. (2016). Volatility Forecasting Analysis of Nine Staples Using
Zahroh, S. N. (2016). ANALYSIS OF RISKS AND PROFITS OF COAL STOCK INVESTMENT ON THE INDONESIA STOCK EXCHANGE (Year 2010-2014). Journal of Development Economics, 13(1), 42. https://doi.org/10.22219/jep.v13i1.3692
Zuhara, U., Akbar, M. S., & Haryono. (2012). The Use of the VaR (Value at Risk) Method in Stock Investment Risk Analysis with the Generalized Pareto Distribution (GPD) Approach. ITS Journal of Science and Arts, 1(1), 56–61. https://doi.org/10.12962/j23373520.v1i1.959