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An Econometric Investigation of Market Volatility and Efficiency: A Study of Small Cap's Stock Indices

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Abstract

By utilization the context of econometric models, this chapter investigates three significant research parameters and tries to find out the positive outcome for further studies. The first question, is the volatility of Small Cap foreseeable?. The second question, does the volatility of Small Cap exhibition the same pragmatic regularities stated in the literature about the behavior of further stock prices?, The third and Final question, can Small Cap clear the test of market efficiency?. The results of these research questions will provide the answers of following objectives: First, economic representatives investing in Small Cap Stock markets. Second, the business professors/professionals/educationist is more concerned in Small Cap for their teaching and research. Third, the policy makers who are observing the stock market volatilities because of its significances and impulsive behavior to invest for more incentives among other consequences.

Keywords: ARCH type models, market volatility, market efficiency, small Cap's stock

1. Introduction

There are two constants in company change and danger which demonstrate unpredictability of money-related resources. Budgetary resources instability is presently unsurprising because of the historic work of Engle [1] which brought forth ARCH models equipped for foreseeing the until now flighty heteroskedastic residuals from the mean equation [2]. Subsequently, a basic inquiry rises: Is exact investigation of budgetary resource instability important; If things being what they are, which substances will see it as significant?

The investigation of budgetary resources instability is essential to scholastics, policymakers, and money related market members for a few reasons. To begin with, the forecast of money related resources instability is basic to financial specialists since it encourages them make sane portfolio hazard broadening, chance decrease, and the board choices. Instability is fundamentally critical to financial operators since it speaks to a proportion of hazard presentation in their ventures. Second, an unpredictable financial exchange is a temperamental securities exchange. Also, an unsteady securities exchange is a genuine worry of policymakers on the grounds that the shakiness of the financial exchange impacts the U.S. economy contrarily [3]. An ongoing declaration expresses that when markets are seen as exceptionally

unstable the apparent instability "may go about as a likely hindrance to contributing" ([4], p. 445). Pindyck [5] suggests that the drop in product expense in the United States in the 1970s can be explained by rises in chance rates coupled with increasing market volatility.

Third, the negative effect of securities exchange instability has pulled in the consideration of numerous researchers. For instance, Garner [6] found that the securities exchange crash in 1987 got a decrease customer spending in the U.S. Likewise, Maskus [7] found that outside trade advertises unpredictability impacts exchange. Fourth, from a hypothetical point of view, unpredictability involves a middle stage in the evaluating of subordinate protections. The core strands of the Black Scholes equation indicate, for example, that the value of an America's calling option is an uncertain aspect. Pragmatically then, options markets can be viewed as an exchange of unpredictability between financial operators.

Finally, stock returns estimation may be assumed to be volatility unpredictability, and this is a major US sector where econometric models of volatility unpredictability are varied. In this regard, a few researchers (e.g., [8]) accept that experimental exploration in displaying instability may in reality bring about the decrease of certainty spans in volatility time-fluctuating certainty time frames bring arrangement back. In the event that this result is legitimate, the study of figure precision will improve. All in all, the former audit obviously shows that securities exchange unpredictability is a beneficial subject of useful and scholarly interests.

Thus, more speculations are rising about the significance of monetary resources instability, and this time from industry specialists. Specifically, venture and money industry examiners hypothesize that financial specialists see little capitalization stock records to be less unstable than enormous capitalization stock lists.' For instance, The Invest Mentor (June 16, 1997) talks about this wonder and infers that it is an uncertain fantasy. Among all little capitalization stock lists, Small Cap (SC) 600 is especially well known, as per industry onlookers. This little top stock list is claimed and overseen by the Standard and Poor's Corporation who accepts that SC 600 is a significant individual from the universe of little tops. Since SC 600 is a subset of the whole populace of little top lists, the individuals who put resources into SC 600 are consequently hostages to the equivalent uncertain fantasy expressed previously. Subsequently, we contend that the instability of SC 600 entices for exact investigation.

In the first place, it is conceivable that the nonappearance of exact examination about the conduct of SC 600 may have added to this uncertain legend in financial specialists' observations. Consequently, there is a requirement for observational examination to advise speculators about the basic factual conduct of SC 600. Second, it is essential to inspect whether the factual portrayals of SC 600 as far as its unpredictability are unique in relation to watched regularities of stock costs by and large. We additionally accept that such observational examination will be an essential preface to resulting investigation into the perceptual legend of speculators. As far as we could possibly know, no examination has done this. We presume that this examination void is a hole in the current information on unpredictability elements and expectation. To this end, at any rate three exploration addresses come into view: (1) Are the volatilities of SC 600 unsurprising? (2) Do the volatilities of SC 600 show the equivalent exact regularities in the conduct of other stock costs? (3) Can SC 600 breeze through the severe structure assessment of market productivity?

The current money-based econometric writing divides these statistical regularities into two increasing, based classifications: I asymmetric or power and (ii) fat-tail distribution or leptocurtosis. Whilst we do not speak politely, excellent reports and talks are made available in writing [9–11]. First of all, the allocation of production

prices is exceptionally high. Negative returns (advanced news) are tracked by higher market valuation changes than positive returns of a comparable scale (uplifting). This wonder, which is now widely called effect effects, is recorded by the landmark focus by Black [12]. More or less the principle of control attests that the responsibility to profit of the shareholding-influenced business proportion will decline in general as stock costs drops. As a result, the expanded interest-based duty would extend the income unpredictability of asset investors. A similar miracle was recorded by Black [12], Christie [13] and Schwert [14]. Dark reveals, however, that financial leverage alone is not enough to explain the magnitude of the asymmetry he has found experimentally. In that spirit, several scholars have argued that the impact (asymmetry) of dangerous prices may be caused by a critique of unpredictability of supply values, leading of shifts in volatility ([15]; World [16, 17]).

The second accuracy of the experiment established leptocurtosis or fat dispersion of product costs. In other words, the distribution of stock interest is more common than Gauss. Mandelbrot [18] and Fama [19] are the basic investigations about it; all provide fat descriptions of allocations of stock interest. This mystery leaves the US government nervous ([3], p. 54.); it makes it difficult [20] for researchers and econometrists to check it ([9], p. 335). Although leptokurtosis cannot be minimized as stock return procedures are standardized, it remains a challenge for the experts to figure out how to minimize kurtosis to the degree of modern conveyor systems.

At long last, when all is said in done, money related resource returns may show zero autocorrelation despite the fact that their squared qualities regularly demonstrate sequential reliance, consequently recommending the nearness of nonlinear conditions in the slacked estimations of the profits—alleged volatility clustering. Volatility clustering (or fleeting varieties) is a noteworthy factor in the disappointment of the experimental appropriations of the arrival arrangement to follow the Gaussian circulation [21]. Comparably, the experimental conveyance of budgetary resource returns displays non-Gaussian appropriation attributes, for example, leptokurtosis just as negative and positive skewness. Despite the fact that these experimental regularities are accounted for in considers concentrating on enormous stock lists, for example, the S&P 500 [14, 22], the degree the equivalent exact regularities are pervasive in SC 600 list is not known.

The research chapter tries to response on the following hypotheses stated in the null.

Null Hypothesis 1: The volatility of SC 600 is not foreseeable.

Null Hypothesis 2: SC 600 does not define the same empirical symmetries detected in the performance of other stock prices.

Null Hypothesis 3: SC 600 does not pass the severe form test of market efficiency.

2. Data and empirical analysis

We accumulate information on day by day shutting costs of the Small Cap (SC) 600 stock value list from January 1990 to August 2019. (The example size is directed by information accessibility, and information are liberally provided by Standard and Poor's Corporation). We follow different researchers (e.g., [23, 24]) to change the arrival arrangement into their log-contrasts registered as log(P) — log (PJ-l)), t = 1, 2, 3, ..., T, yielding exchanging days.

This technique manages two points of interest. To begin with, it disposes of the conceivable reliance of changes in the stock value record on the value level of the list. Second, the adjustment in the log of the stock value record yields a persistently intensified arrangement.

Series	Results and observations
Sample	1/01/1990 to 8/19/2019
Observations	7422
Mean	0.000397
Median	0.000841
Maximum	0.134563
Minimum	−0.088775
Standard deviation	0.012459
Skewness	0.424301
Kurtosis	13.41909
Jarque-Bera	9057.557
Probability	0.000000

Table 1.
Descriptive statistics.

The mean of the arrangement is incredibly little, near zero (0.0004), and the unqualified standard deviation a proportion of variety is very little (0.01). This finding recommends the nonattendance of non-simultaneous (dainty) exchanging during the example time frame. Precluding non-simultaneous exchanging, the watched little variety might be because of some type of market vanity.

The arrangement is adversely slanted (−0.26) with abundance kurtosis more than double the kurtosis for a Gaussian dispersion. In total, the arrangement is profoundly non-ordinary (asymmetric) as affirmed by the Jarque-Bera2 test for ordinariness. At the end of the day, the invalid of ordinariness is firmly dismissed, as the proof in **Table 1** recommends. At long last, the first experimental outcomes prove various examinations on stock value conduct.

In this way, hypothesis 2 is dismissed. Equally, as our theories are expressed in the invalid, a dismissal of the invalid implies that SC 600 shows indistinguishable watched regularities from other stock costs and stock cost records. At last, despite the fact that this primer experimental proof gives defense for ARCH demonstrating for our informational collection, we in any case give extra support to ARCH displaying following the proposals by Engle and Ng [25].

3. ARCH modeling

Both the observational writing on ARCH demonstrating systems [10] and ongoing surveys of ARCH models [9, 22] offer help showing that ARCH displaying is fitting for the current chapter. For instance, Bera and Higgins [9] announce that "leptokurtosis in the unqualified dissemination is an attribute of contingent heteroskedasticity information." This affirmation by Bera and Higgins focuses to the proof appeared in **Table 1** above. Second, stock record returns are famously known for positive autocorrelation at high frequencies [19, 26, 27] which incorporates every day frequencies for the current chapter. The information for the current chapter fulfills this condition. Third, one of the experimental regularities talked about above stock return circulations is autocorrelation in the crude arrangement and their squares. Autocorrelation in the squares of the crude arrangement is characteristic of instability bunching (fleeting variety) in the heteroskedastic second snapshot of the arrival arrangement. It is regular practice to accept these highlights

as proof on the side of the way that an ARCH model will fit the informational collection of intrigue.

To address the former concerns identified with autocorrelation, we test for autocorrelation in the crude returns and their squares. We dismiss the invalid of no autocorrelation in both the crude returns and their squares utilizing Ljung-Box (L-B) Q-insights. We figure Ljung-Box Q-insights for 36 slacks (we report 10 slacks) for both crude returns and their squares to test for straight and nonlinear conditions, separately. We dismissed the invalid of no straight conditions in the profits and no nonlinear conditions in their squares. The outcomes are appeared in **Table 2** beneath. All the slacks are noteworthy, and the squares are obviously bigger. Once more, straight conditions might be because of some type of market defects, as non-simultaneous exchanging is managed due to the unqualified standard deviation examined previously. Moreover, nonlinear conditions are generally ascribed to the nearness of autoregressive restrictive heteroskedasticity (i.e., ARCH) proposing that ARCH kind displaying is essential [28]. At long last, the bunching present in the squared returns proposes that an ARCH kind definition will rough the structure of the heteroskedastic second, and that is actually what ARCH models are intended to achieve [29].

At last, a few researchers recommend that a factual test should initially affirm the nearness of an ARCH impact in the arrangement as opposed to force an ARCH sort model on the information [25, 30]. We will call this methodology ex-risk test for ARCH impact. To this end, we utilize a system proposed by Breusch and Pagan [30] and talked about in Wooldridge [31]. In particular,

$$RS_t = C + RS_{t.t} + U_t \qquad (1)$$

where RS denominates the raw returns, C denominates the constant, RQ is a one-day lag of the raw returns and U is the error of the OLS framework. The results are in panel A in **Table 3**.

Next, our purpose is to collect U, and fit the following regression:

$$\hat{u}_t^2 = c + RS_{t-1} + \hat{e}_t \qquad (2)$$

where û denominates the square of the residual from equation and is regressed on a constant and one lag of raw returns. The results are in panel B in **Table 3**. Finally, we fit

$$\hat{u}_t = c\text{-}\hat{u}_t + \hat{e} \qquad (3)$$

where û, one period lag of (û}_,) and C are as defined âi equation above. We report the results in panel C in **Table 3**.

Drawing experiences from Wooldridge (2fD3) to define the conclusion of Breusch and Pagan (B-P) tests in **Table 3**, the outcomes are striking in key regards.

	1	2	3	4	5	6	7	8	9	10
Lag1	0.086	−0.047	0.027	0.024	0.01l	0.030	0.012	0.036	−0.004	−0.045
	(14.9)	(19.3)	(20.7)	(21.9)	(22.1)	(23.8)	(24J)	(26.7)	(26.8)	(30.8)
Lag2	0.112	0.082	0.098	0.094	0.057	0.075	0.057	0.070	0.011	0.056
	(29.5)	(42.8)	(61.9)	(79.4)	(85.8)	(97J)	(104)	(I13)	(140)	(146)

All values are significant at P = 0.000.

Table 2.
Sample autocorrelation.

Panel A: model (1)			
Variable	Coefficient	T-statistics	P-value
C	0.00029 (0.0002)	29	0.21
RS$_{t-1}$	0.089 (0.022)	3.9	**0.0001**
Panel B: model (2)			
Variable	Coefficient	T-statistics	P-value
C	0.0001 (1.19E−5)	13.1	0.0000
RS$_{t-1}$	−0.005 (0.001)	−4.7	0.0000
Panel C: model (3)			
Variable	Coefficient	T-statistics	P-value
C	0.00009 (1.31E−05)	9.9	**0.0000**
û$_t$	0.15 (0.0198)	7.0	0.0000
Panel D: model (4)			
Variable	Coefficient	T-statistics	P-value
û$_t$	0.0051 (0.019)	0.19	0.79

Table 3.
ARCH analysis.

To start with, the t-measurement (− 4.7) on the slacked return in board B recommends solid proof of heteroskedasticity in the profit's arrangement. Second, the negative coefficient (−0.005) can be deciphered as follows. The instability of SC 600 is higher when the past return is low, and the other way around (cf. [31], p. 415). Accordingly, this finding confirms a piece of the revealed regularities about the unpredictability of stock value returns examined in past areas of the current chapter (cf. [31], p. 415). Third, this finding supports bountiful examinations in the account writing showing that the normal estimation of stock returns is not an element of past return esteems however a component of the change of past returns. Equally, in settling on their speculation choices, normal financial specialists would assess the difference of profits in their venture choices and not the normal (mean) estimation of the profits. The fluctuation of profits is definitely more a basic factor in venture choices than are the normal (mean) returns.

Despite the fact that these results are intriguing in their own right, our principle design is the ex-bet test for an ARCH impact. To this end, we turn to board C in **Table 3**. The t-measurement (t = 6.6) on the one-time frame slack of the mistake shows an ARCH impact (cf. [31], p. 417). At long last, after Wooldridge [31] we utilize the previous system to test the market effectiveness of the SC 600 stock list by relapsing û, on û$_{t-1}$ as expressed in condition (3) above. The outcomes are accounted for in board D in **Table 3**. The effective market theory (EMH) translation of this outcome originates from the finding that the OLS residuals squared are autocorrelated, highlighting heteroskedasticity of the subsequent second. In any case, the OLS residuals (not squared) are not autocorrelated. These outcomes recommend that a speculation technique dependent on notable data in the profit's arrangement is useless. At the end of the day, this is the exacting type of the EMH test [19] as in data seized in past stock costs is pointless in foreseeing current and future costs revenue driven abuses.

At last, a subsequent method to test for an ARCH impact is to fit an ARCH sort model on the information of intrigue and test whether there is any staying ARCH impact in the model assessed. We will consider this methodology the ex-post-test

for the nearness of ARCH impact. This is the most widely recognized methodology in the surviving money related econometric writing where the Lagrange multiplier (LM) test measurement has become the workhorse (e.g., [10]). These outcomes are accounted for under the ARCH models introduced underneath.

Despite the fact that we have indicated proof defending ARCH models for the current chapter, we cannot continue without sifting the autocorrelation announced in **Table 2**. Autocorrelation renders fixed arrangement non-fixed, as exhibited by Bera and Higgins [9]. Commonly, a moving normal of request one [i.e., MA (l)] has been discovered sufficient to cleanse autocorrelations of this greatness (cf. [32]). Henceforth, MA (1) is fit the raw returns in the system of the model (4). That is,

$$R_t = S_t + \delta X_{t-1} \tag{4}$$

Next, let é be a gauge of the deviations of the raw returns back from a MA (l) of anticipated (mean) return. This amount is a contribution to the ARCH models talked about beneath.

Since ARCH models are a group of models, we test and locate that a summed-up ARCH (i.e., GARCH) is the best miserly model portraying the information producing procedure of SC 600 for the accompanying reasons. Initial, a GARCH model is an unbounded request ARCH model [33]. Second, a GARCH model is an ARMA model [29] having a place with model (4) above. At last, our examination 3 recommended ARMA (0,1)- GARCH (1,1) model as a lower request of the higher-request type appeared in conditions (5) to (7) underneath, (cf. [33]). That is:

$$r_t = \mu + \sum_{i=1}^{p} a_i r_{t-1} + \sum_{i=1}^{q} b_i \varepsilon_{t-1} + \varepsilon_t \tag{5}$$

$$\varepsilon_t = z^{th}_t \approx N(0, 1) \tag{6}$$

$$h_t^2 = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-1}^2 + \sum_{i=1}^{q} \beta_i h_{t-1}^2 \tag{7}$$

It regularly is expected that the mean procedure in condition (5) is direct and the unsettling influences are developments following the Gaussian circulation. Elective plans of the contingent fluctuation work.

There is Eq. (5). Sub-set constraints on the general structure's parameters define special cases and allow for limited heterogeneity and stationarity in such alternate formulations (see [33]). In model (7), q is the number of lagging conditions and p is the number of lagging sample variances (the squared random return component) [1, 33]. The characteristic of the symmetrical GARCH model is that it involves and parsimoniously integrates heteroscedasticity in the volatility calculation. Nevertheless, the model is well established because the infinite self-reign organized coefficients are all non-negative, and the roots lie behind the moving average polynomial of quadrangular inventions. The restricting of the value parameter, 'p = z'o + z'b < 1, should: (1) calculate the magnitude of continuous shock fluctuations, (2) ensure the consistency and stationary covariance of the error mechanism, and (3) ensure that finite unconditional variations are essential. Halfway-life4 is 1/2 L = [-In(2)/In(T)] persistence of the shake. Eventually, in Eq. (8), we approximate a lower GARCH model number as defined in **Table 4**.

The mean of the index return is the linear function of the time-divergent variance (h) under the ARMA (0,1)-GARCH (1.1) model. If the errors (e,) are serially associated and obey a method of MA (1), the variances (ht or volatility) are cantered in the time-t-1 data set f2. In fact, f1 makes past (volatility) conditional

	Equation of mean					Equation of variance			
x	**t**	**θ**	**t.**	**a₀**	**t**	**α**	**t**	**β**	**t**
0.0009	4.9	0.19	5.9	1.7E−6	3.1	0.19	7.1	0.862	40
[0.000]		[0.026]		[6.9E−07]		[0.025]		[0.021]	
(0.000)		(0.023)		(3.24E−07)		(0.012)		(0.011)	

Table 4.
ARCH (0,1) and GARCH (1,1).

variances and squared error terms crucial. Thanks to the positive result in **Table 4** and the restriction •F = Z, + T, {ii < 1 is fulfilled, the model has a stationarity of second order [33]. The role of both x and d supports the predicted ARCH and GARCH impact.

The following statement is that "i" = Z;'; + Z, §, < l = 0.996, suggests strong durability uncertainty. The mean-revision is also found to almost fulfill the requirement of unity. Such findings contribute to the methodological regularities that confuse financial cyans ([9], p. 342).

It is evidence that Hypothesis 2 is not appropriate. Finally, the half lifespan is l/2 L = [-In(2)/In('P)] = 69 days, while the uncertainty is only half large. We are turning now to the alerts mentioned so far on the basic GARCH model.

The source of GARCH norm caveats is the calculation, for the first time, of the variation in finance as predicted square deviations from a standard position. A linear combination of a constant, past conditional variance, lagged, squared errors — and that is a symmetrical GARCH model — is thus a statistical logical way of approaching the direction of time variance to present conditional variance [33]. [33] The quadrature of past mistakes to prevent negative differences imposes a symmetrical structure which implies a significant effect on the variability of current shocks from the past. Among others, the leverage effect cannot be captured by a symmetric GARCH model. Furthermore, in the sense that the squaring is a symmetrical layout from GARCH is essentially a quadratic specification. The symmetric GARCH model is thus not effective if the shock effect on current returns approaches a quadratic magnitude. In addition, the degree to which the retour-generating process of a given data set displays such alerts represents the limitations and assumptions based on GARCH's symmetrical models. In other words, asymmetric models from GARCH are required.

Engle and Ng [34] show, according to this criterion, that the TGARCH model Glosten, Jagannathan and Runkle [35] is the best parsimonious GARCH model that is available. We thus show the Glosten, Jagannathan and Runkle concept for the first time. We shall then use it for the purposes of this article.

The appeal of asymmetric GARCH models is based on the capture volatility asymmetries. It is possible to describe the pattern Glosten, Jagannathan and Runkle as follows. Consider expanding the above model (10) with the inclusion of a D indicator component, so that the first error lag is negative with a Dt-l < 0 and null, if the mean function is not positive.

This yields the regime switching model with zero as the threshold in

$$h_t^2 = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-1}^2 + \sum_{i=1}^{q} \beta_i h_{t-j}^2 + \gamma \varepsilon_t^2 d_{t-1} \qquad (8)$$

TGARCH has curious properties: it makes the effect on subsequent variance of positive (negative) shocks (c2) when y > 0 (< 0). Note that IX alone catches good news (increasing interest for the asset) during bad news during bad news.

	Coefficient	Std. error		T-ratio
Panel A: mean equation				
X	0.0006	[0.0002]	(0.0006)	2.9
Θ	0.174	0.0275	(0.0220)	6.3
Panel B: variance equation				
ω	2.11E−6	[7.21E−7]	(2.81E−7)	3.1
α	0.057	[0.030]	(0.0130)	1.93
y	0.189	[0.044]	(0.0208)	4.3
β	0.845	[0.010]	(0.0104)	80.88

Table 5.
TGARCH test.

(Activity price decrease) shall be captured at n + y. If >0 happens, the leverage effect would be measured by the sum n + y for poor messages (reduced asset price). If y 0, the results of the news are asymmetric. If the (e} series implements an ARMA cycle, the vector (e^2,e^2) of shock may use an ARMA cycle as GARCH model. **Table 5** offers comprehensive findings.

There are remarkable findings in **Table 5** from the Glosten, Jagannathan and Runkle TGARCH. Next, the ARCH word (ti) is significant but not so unified that volatility shocks are not destructive. Furthermore, the nonlinear dummy coefficient is strong and positive. It means that: (a) the leverage effect persists and (b) the influence of news is asymmetrical, or similarly optimistic inno- vs. the negative effect of the news on uncertainty. Finally, with a powerful effect, the term GARCH (b) is significant. Critical to resolve a breach of the assumption of normality, again, two types of standard errors have been reported: (a) frequent and inefficient standard errors, which are not compliant with Gaussian distribution assumes, and (b) stable standard and covariance error by Bollerslev-Wooldridge, which is consistent and efficient when the assumption of normality is broken. You may inquire whether these versions are listed correctly. We apply a diagnostic device battery to determine product requirements.

4. A battery of diagnostic tests for model specifications

The residuals must be white noise unless the configuration is correctly defined (i.e. the stanch ionic remains must be zero mean and have unit variance). Remember in the above **Table l** that, on the raw series rates and squares, we dismissed the zero hypothesis with no self-correction. This autocorrelation will only exist if and only if the templates are properly defined in the typical waste materials and their square regions. We directly use Ljung-Box Q statistics to reach the adequacy of the model by analyzing the standardized (normalized) residuals (e,/h|′ 2) and standardized square residuals (s,/h '2). Directly let E and h be estimates of the error and conditional variance.

Kurtosis coefficients are around fifty per cent larger for the two models listed in **Table 6** than for the Gaussian distribution, although the figures showed that the model is acceptable. Second, the model misspecification concerns arise in the framework of above **Table 6** if the coefficient sample autocorrelation and partial autocorrelation (PACs), calculated as 2/(T), is more than double the value of their asymptotic standard error (ASEs) "2 = 0.044, **Table 6** does not have an AC or PAC

	Standard GARCH				TGARCH			
		AC	PAC	Q		AC	PAC	Q
(s,/h,′ 2)	L-B (10)	−0.011	−0.011	3.5	L-B (10)	−0.009	−0.010	3.9 s
(s,/h,″)′	L-B (10)	−0.028	−0.028	4.3	L-B (10)	−0.029	−0.030	5.0
Skewness	−0.369					−0.280		
Kurtosis	5.804	13.96••	6.048	14.00**				

*"••" and "**" shows the significance at p = 0.000*

Table 6.
Standard GARCH and TGARCH models.

value close to that value. This proposal is fulfilled, as shown in **Table 6**, because the kurtosis is more than twice that for the non-standardized residual. Fourth, in a proprietary unpublished paper reported by Keam and Pagan, we are using the Pagan and Sabau [36] specification test. In particular, Kearn and Pagan are proposing to square residue out of the mean equation and regress to perform their tests with a constant and conditional variation (h2) in the following ways: (24) Alles and Murray ([37], p. 140) included this test in "a diagnostic test":

$$s—c + bh + e \tag{9}$$

In fact, model (9) investigates how many variances can be clarified by situation variances in the unknown actual volatility (proxied by e). As the regressed as well as the regressor are at least theoretically the same in the ARCH model's framework, the equation slope (9) should ideally be equal to unity, with zero intercept. Then you can determine the fit of the model using R2. **Table 7** reports the results.

The findings of the Keam-Pagan (K-P) check in **Table 7** prove that the evidence supports the theoretical assumptions. First, the intercepts (called C) vary little to zero. Secondly, there are extremely positive and high slope coefficients. Third, with standard errors insignificantly different from zero, both coefficients are statistically significant in less than five percent. Fourthly, it is important to remember that the TGARCH is greater in R^2 than the regular GARCH, and the model's explanatory forces are R2-based. It should not come as a surprise that TGARCH should be able to collect asymmetries from the data better than the standard GARCH does. This is an indirect proof of the overall asymptotic superior success of Glosten et al. in the recording results gap for both models (1993) as Engle and Ng [34] models of capture of asymmetries in volatility. In the same way, the results discrepancies give subtle proof that the traditional GARCH model struggles to chart the data's asymmetries.

Finally, Diebold [38] suggests, among other things, that, if the GARCH model is defined correctly, no ARCH effects in mean and variance equations respectively in the uniform residual rates and squares will remain. This test is a Lagrange multiplier test asymptotically equivalent to T * R2, where T is the sample number, and R2 the known determination coefficient. This test is also a K-degree free chi-square test.

	Standard GARCH		t-ratio	TGARCH		t-ratio
C	7.1E−5	(1.6E−5)	4.4	3.1E−05	(1.3E−5)	1.79
b-coefficient	0.519	(0.049)	9.9	0.699	(0.08)	12.8
R^2	0.513			0.842		

Table 7.
Keam-Pagan (K-P) test.

For the standard GARCH model the results are (computed as T• R2) 0.109 (p = 0.74) and (T• R2) 0.043 (p = 0.834) for the TGARCH model. These trivial p- values thus suggest a dismissal of the null hypothesis that the results maintain ARCH impact. In summary, our diagnostic test battery overall indicates that models are stated correctly.

5. Conclusions

This chapter addresses the value of high stock market fluctuations and three predictions: economists, investors, and policy makers. The fact that uncertainty is an important phenomenon to these institutions is illustrated by quotes from current literature in financial economy. While much analytical attention has been paid to the volatility of large cap inventory indices, there is been little concern for the volatility of the small cap indices. At least three methodological problems to be explored using small caps (SC) 600 for analysis purposes are described in this article.

The primary focus of the chapter is on these testable theories. Hypothesis 1 is a validation of the statement that SC 600 variance cannot be expected. This theory has been refuted on the basis of evidence that low cap volatility of 600 can be forecasted in the same way as other stock prices are expected by regular GARCH and TGARCH models. Hypothesis 2 is a hypothesis to the extent that SC 600 is not similarly empirically compatible with other stock values. The findings demonstrate, in terms of observable methodological regularities that govern the empiric distribution of stock prices in general, that the SC 600 exhibits the same statistical characteristics.

In conclusion, hypothesis 3 tests the argument that SC 600 cannot pass a rigorous market efficiency test for the form. This hypothesis is dismissed, which indicates that SC 600 has passed the Effective Hypothesis Test (EMH). Our findings may be seen as the start of further research on the behavior, particularly with respect to the EMH measure, of other small equity indices. Our findings especially encourage further research into a closer empirical study of the unresolved myth in investor perceptions.

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