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Random walks in the different sectoral submarkets of the Philippine Stock Exchange amid modernization

Cesar C. Rufino
School of Economics, De La Salle University–Manila

This study explores the weak-form efficiency of the Philippine Stock Exchange (PSE) and its different sectoral markets using modern inference techniques with robust statistical properties. The research is motivated by the lack of consensus in the literature on the informational efficiency of the country's stock market and the apparent scarcity of studies on the same issue using data covering the period of massive modernization of the exchange, geared toward transparent disclosures and integrity of transactions. The study may also be considered a fitting assessment of why the PSE is setting the pace over most stock exchanges in Asia in terms of growth levels across key stock market indicators, culminating in a highly successful year 2012 when it ranked ninth among the ten best-performing stock markets of the world. Evidence presented by the results of the study suggests the presence of overall informational efficiency in the Philippine Stock Exchange during the period under review.

JEL classification: C14; G14; G15
Keywords: random walk, market efficiency, panel unit root tests, variance ratio tests, wild bootstrap, stock exchange modernization.

1. Introduction

One of the most enduring empirical questions posed by investors, speculators, economists, and academics all over the world is whether stock market prices follow a random walk. Investors and speculators often work under the presumption that stock prices are predictable and therefore do not follow a random walk, but most economists and academicians take the opposite view because of their belief in the inherent efficiency of capital markets where prices cannot be dependably predicted. A great volume of research has been done to settle the issue across time and settings, using different methodologies and data frequencies, but mixed findings often emerge.

The academics' belief in the viability of the random walk hypothesis is anchored on the so-called weak-form market efficiency theory first proposed by Samuelson [1965] and Fama [1965], which posits that asset prices fully and instantaneously reflect all available and relevant information, such that price adjustments are immediate in a manner that returns cannot be accurately predicted. This is the classical manifestation of a random walk or a martingale process. Studies regarding asset prices predictability almost always involve empirical testing of the efficient market hypothesis (EMH) or examining whether returns follow a martingale difference sequence (MDS).

Some explanations are proposed for the predictability of asset returns that stock market investors may be holding on to. Melvin [2004] proposed that in markets where MDS does not hold, prices are not quick enough to adjust to new information, creating fleeting arbitrage that investors can take advantage of. Market distortions due to risk valuations and pricing of capital [Smith, Jefferis, and Ryoo 2002] and government interventions [Yilmaz 2003] may create disequilibrium of market prices, thus veering away from efficiency. Lo [2004] theorized the reconciliation of the EMH with the adaptive market hypothesis (AMH) through the notion of bounded rationality. He proposed that predictability may happen from time to time due to changing market conditions (e.g., bubbles, crises, crashes, etc.) and other exogenous factors.

A good number of empirical articles have been written about the Philippine stock market to determine whether the local bourse conforms to the tenets of the EMH. Some of these studies feature the Philippines as part of a cross-country analysis. Table 1 exhibits a brief summary of the findings of selected studies showing the methodologies employed, data frequency and time period covered, as well as the results on the test about the acceptance or rejection of the weak-form efficient market hypothesis. From these results, one can glean the lack of consensus on the validity of the phenomenon in the local stock market.

Table 1. Selected studies on the random walk hypothesis involving the Philippine stock market

Empirical studies	Data frequency and period	Methodology	Market	Result on random walk hypothesis
Gregorio and Saldaña [1990]	Daily	Moving average stock trading rule	PHI	Not rejected
Cayanan [1994]	Daily, 1990–1992	Regression analysis and cointegration	PHI [selected stocks]	Rejected
Huang [1995]	Weekly, 1988–1992	Variance ratio, ADF unit root tests	HK, IND, KOR, JPN, PHI, SIN, TWN, THA	Not rejected for PHI, IND, & TWN
Binsol and Bonzo [1996]	Daily, January 1987–October 2000	ARFIMA	PHI [oil index]	Rejected in favor of long memory process
Kawakatsu and Morey [1999]	Monthly, 1976–1997	Variance ratio, multiple variance ratio, and ADF unit root tests	KOR, MAL, PHI, TWN,THA	Rejected cross-country
Bautista [2001]	Weekly, 1987–2000	Artificial neural networks	PHI	Not rejected at short lags, but rejected at longer lags
Aquino [2006]	Daily, July 1987–May 2004	ARIMA	PHI	Not rejected
Hoque, Kim, and Pyun [2007]	Weekly, April 1990–February 2004	Variance ratio, multiple variance ratio tests	HK, IND, KOR, MAL,PHI, SIN, THA, TWN	Rejected except for KOR and TWN
Kim and Shamsuddin [2008]	Daily & weekly, January 1990–April 2005	Multiple variance ratio tests	HK, IND, JPN, KOR, MAL, SIN, TWN,THA PHI	Rejected for IND, MAL & PHI
Hamid, Shah, and Akash [2010]	Monthly, 2004–2009	Runs test, variance-ratio test, and Ljung-Box Q-statistic test	PHI	Rejected

The present study is an attempt to contribute to the growing literature on the predictability or unpredictability of the returns from the Philippine Stock Exchange (PSE), considered one of the top ten best-performing stock markets in the world in 2012 [CNNMoney 2013], using contemporary empirical data on the various sectoral markets comprising the PSE. The study is also motivated by the need to assess the efficacy of the various operational changes implemented by the exchange to enhance the integrity of transactions and improve the system of disclosures of relevant information. To ensure robustness of the results, the study employs some of the cutting-edge techniques currently used in modern finance literature to provide compelling evidence in resolving the debate for or against the random-walk hypothesis in the Philippine context.

2. Methodology

The state of the art in testing the validity of the random walk hypothesis for asset prices gradually evolved from the use of simple moving averages and analysis of graphs and correlations into sophisticated inference tools and the use of artificial intelligence models. The current staple in the empirical evaluation of the ascendancy of the weak-form EMH involves a modified version of the variance ratio (VR) test introduced in an influential seminal paper by Lo and McKinlay [1988]. In the present paper, one of the most modern versions of this test is employed: the wild bootstrap variance ratio test of Kim [2006]. In addition, the classic Lo-McKinlay VR test, and a robust multiple VR test [Chow and Denning 1993] are also employed for comparative analysis. The choice of the adoption of the wild bootstrap VR test as the primary model to use stemmed from the recent publication of the results of Monte Carlo analysis of the power of alternative tests for the martingale difference hypothesis (MDH) in which the wild bootstrap test emerged as among the most powerful, with superior small-sample properties [Charles, Darne, and Kim 2011].

Proving that the underlying asset price series follows a martingale difference sequence is just one of the necessary requirements of an informationally efficient market. MDS, the presence of which is evaluated by the VR tests, only signifies that any positive increments of the series are uncorrelated. The other condition is the existence of the unit root component of the series (Liu and He [1991]; Azad [2009]). If these two properties exist in a financial market, the financial series is said to follow a random walk. In this study, the presence of the unit root component is empirically determined in all submarkets of the Philippine Stock Exchange using a battery of panel unit root tests (Levin, Lin, and Chu [2002]; Maddala and Wu [1999]; Im, Pesaran, and Shin [2003]). To conserve space, technical discussion of these tests is omitted, since the study highlights the more important MDS evaluation.

2.1. The variance ratio tests

Perhaps the most popular empirical technique used in checking the existence of a martingale difference sequence in an observed realization of a time series is the so-called variance ratio test. This test emanates out of a simple specification of the data-generating process of a series whose first difference or logarithmic first difference follows a martingale process [Escanciano and Lobato 2009]. The VR methodology consists in testing the MDS hypothesis by exploiting the MDS property that the variance of its increments is linear in all lags. In other words, the sample variance of the q-period increment of an MDS process is q times the sample variance of its one-period increment. Hence, the VR at lag q is defined as the ratio of $1/q$ of the variance of q-period return with the variance of single-period return of the process. When the process is truly an MDS, this variance ratio should not differ significantly from unity for all positive q.

Lo and McKinlay [1988] formulated two test statistics for the MDS hypothesis. The first works under the strong assumption that the increment is i.i.d (identically and independently distributed) corresponding to the homoscedastic or i.i.d. null random walk hypothesis. In the other test statistic, Lo and McKinlay downgraded the i.i.d assumption to allow some general types of conditional heteroscedasticity and serial dependence (akin to GARCH assumptions), which are often seen in financial time series. The associated null hypothesis under this assumption is the heteroscedastic random walk hypothesis, frequently called the martingale or m.d.s. null, since the increment is technically a martingale difference sequence [Escanciano and Lobato 2009].

2.1.1. The test statistic under the i.i.d null

If $\{y_t\}$ is a realization of the process $\{Y_t\}$ with a sample size T, the variance-ratio (VR) needed to test the hypothesis that $\{Y_t\}$ is i.i.d. is defined by Lo and McKinlay as

$$VR = \left\{ \frac{1}{qT} \sum_{t=q+1}^{T} (y_t + y_{t-1} + \ldots + y_{t-q} - q\hat{\mu})^2 \right\} \div \left\{ \frac{1}{T} \sum_{t=1}^{T} (y_t - \hat{\mu})^2 \right\} \tag{1}$$

where $\hat{\mu} = T^{-1} \sum_{t=1}^{T} y_t$.

This statistic should not differ significantly from 1 for any integer $q > 1$ if the increment is i.i.d., but not if it is serially correlated. Lo and McKinlay [1988] proved that under i.i.d.,

$$\sqrt{T}\ (VR - 1) \rightarrow asy\ \ N[0,2(2q-1)(q-1)/3q] \tag{2}$$

$$Z = (VR - 1)\sqrt{3qT/[2(2q-1)(q-1)]} \rightarrow asy\ N(0,1) \tag{3}$$

2.1.2. The test statistic under the m.d.s. null

Under the heteroscedastic random walk hypothesis, Lo and McKinlay [1988] derived a robust version of (3) to account for time-varying volatility and autocorrelation of the underlying series and arrived at the following test statistic:

$$Z^* = (VR - 1)\ (\sum_{j=1}^{q-1} \{[2(q-j)]/q\}^2\ \delta_j)^{-0.5} \tag{4}$$

where

$$\delta_j = \left\{ \sum_{t=j+1}^{T} (y_t - \hat{\mu})^2 (y_{t-j} - \hat{\mu})^2 \right\} \div \left\{ \left[\sum_{t=1}^{T} (y_t - \hat{\mu})^2 \right]^2 \right\} \tag{5}$$

Lo and McKinlay showed that if Y_t is an MDS, then Z^* is asymptotically normally distributed with mean zero and standard deviation of 1.

2.2. The multiple variance ratio tests

Since the variance ratio restriction holds for every q difference of the underlying series, for $q > 1$, it is customary to evaluate the test statistics (3) and (4) at several selected values of q (in this study q is set for $q = 2$, 4, 8, and 16). Chow and Denning [1993] proposed a test statistic used to examine the absolute values of a set of multiple variance ratio statistics (for the different set values of q).The main purpose of this statistic is to control the size of the joint variance ratio test to be implemented.

The null hypothesis for the Chow-Denning multiple VR test is set as the joint statement

$$VR(q_i) = 1 \text{ for i} = 1, 2, \ldots, \text{m} \tag{6}$$

against the alternative hypothesis

$$VR(q_i) \neq 1 \text{ for some holding period } q_i . \tag{7}$$

The Chow-Denning test statistic can be written as

$$MV = \max|M(y;q_i) \text{ for } 1 \leq i \leq m \tag{8}$$

where

$$MV(y;q_i) = VR(q_i) - 1)\{\sum_{j=1}^{q-1}[\frac{2(q_i - j)}{q_i}]^2 \delta_j\}^{-0.5} \tag{9}$$

and

$$\delta_j = \left\{\sum_{t=j+1}^{T}(y_t - \hat{\mu})^2(y_{t-j} - \hat{\mu})^2\right\} \div \left\{\left[\sum_{t=1}^{T}(y_t - \hat{\mu})^2\right]^2\right\} \tag{10}$$

The Chow-Denning (CD) test is anchored on the idea that any decision on the null hypothesis can be based on the maximum absolute value of the individual *VR* statistic under the m.d.s. assumption of Lo and McKinlay [1988]. Under such assumption, CD statistic follows the studentized maximum modulus (SMM) distribution with m and T degrees of freedom [Chow and Denning 1993], whose critical values are tabulated in Stoline and Ury [1979]. The p-value for the CD statistic is bounded from above by the p-value for the SMM distribution with parameters m and T, with T approaching infinity.

2.3. The wild bootstrap variance ratio test

Efron [1979] pioneered the concept of the bootstrap, which is a resampling procedure that approximates the sampling distribution of a test statistic. This procedure is often resorted to in evaluating test statistics that operate under unconventional assumptions and/or under small sample conditions.

To implement the bootstrap in approximating the m.d.s.-based Lo-McKinlay test statistic (4) and the m.d.s.-based Chow-Denning test statistic

(8), Kim [2006] used the wild bootstrap of Mammen [1993] to develop a procedure that can roughly estimate sampling distributions such as (4) and (8), which are robust to unknown forms of conditional and unconditional heteroscedasticity. The procedure developed by Kim [2006] has been receiving good reviews in the literature as having the most power aside from having superior small sample properties among competing methodologies (e.g., Charles, Darne, and Kim [2011]; Kim and Shamsuddin [2008]; Hoque, Kim, and Pyun [2007]).

Simply put, the Kim [2006] procedure is conducted in three stages, as applied, for example, to the Chow-Denning test statistic (8):

Form a bootstrap sample of T observations $y_t^* = \eta_t y_t$ for $t = 1, 2, \ldots, T$ where η_t is a random sequence having the properties: (a) $E(\eta_t) = 0$ and (b) $E(\eta_t^2) = 1$.

1. Calculate $MV^* = MV\,(y_t^*\,; q_i)$ with $MV\,(y_t^*\,; q_i)$ statistic generated from the bootstrap sample obtained in stage 1.
2. Repeat stages 1 and 2 in a sufficiently large number of replications, say, m times to form a bootstrap distribution of the test statistic (8). The bootstrap distribution is now used in approximating the sampling distribution of the CD test statistic. The p-value of the test can be obtained as the proportion of the bootstrap distribution greater than the CD test statistic value obtained from the original data.

The wild bootstrap of the Lo-McKinlay test statistic (4) can be implemented similarly as a two-tailed test. To implement the wild bootstrap test, Kim [2006] suggests the use of the standard normal distribution for η_t, although simulation results are insensitive to other distributions like the two-point distribution of Mammen [1993] and the Rademacher distribution developed by Hans Rademacher (1892–1969).

2.4. The data and its composition

The Philippine Stock Exchange has just reached its 20th year as a unified exchange out of the merger of Manila Stock Exchange, one of the oldest in Asia, and Makati Stock Exchange. The goal of this unification is to enhance the growth of the capital market in the country. For the last several years, it has been setting the pace over most stock exchanges in Asia in terms of growth levels of primary stock market indicators. Last year, the market grew by close to 30 percent and the amount of capital raised is more than three times its average level during the past three years. Also last year, the PSE was adjudged as one of the top ten best-performing stock markets in the world [CNNMoney 2013] ranking number 9 with 26 percent gain from 2011. This year, the PSE is currently on a sustained bull run.

The PSE index series is composed of the main index: the PSEi, six sectoral indices, and the all-shares index. The six sectoral indices representing the major sectors under the revised industry classification of the PSE are (1) financials index, (2) industrial index, (3) holding firms index, (4) property index, (5) services index, and (6) mining and oil index. Together with the all-shares index, daily closing values of these sectoral indices over the period October 2006 to May 2012 constitute the database of the present study. These daily prices are converted into weekly figures represented by the closing index values for Wednesdays (if Wednesday is a nontrading day, either of the contiguous days Tuesday or Thursday is used to ensure that there is no gap in the data) producing a total of 343 observations—which may be considered small when compared to usual sample sizes of similar studies in the literature.

The weekly data are used in the analysis because of the built-in biases associated with the daily series (e.g., nontrading, bid and ask spread, asynchronous prices, etc.) (Lo and MacKinlay [1988]; Azad [2009]; Darrat and Zhong [2000]), but this consequently decreases the sample size. Although short, covering a span of only a little over five years, the period of the study covers the extensive modernization of the PSE, starting with the adoption in 2005 of the online disclosure system or the ODiSy, providing 24/7 online system access for the submission and announcement of all types of disclosures. In 2007, the PSE acquired the advanced warning and control system, a state-of-the-art computerized surveillance system designed to further enhance the integrity of the stock market. Appendix A shows the various modernization moves implemented by the Philippine Stock Exchange.

3. Results

3.1. Descriptive analysis of returns in the PSE submarkets

The time graphs of the weekly sectoral indices and the all-shares index are presented in Figure 1, where seemingly random patterns are seen for each graph but with a pronounced trough reached sometime in 2008 or during the onset of the financial crisis in western countries. After that bottom, all indices started to exhibit sustained long-term upward trend, which may be said to be still ongoing. Short-term fluctuations, however, appear to be erratic.

Descriptive analysis of returns in the different sectors of the market is presented in Table 2. It shows excessive departure from normality of in all sectors and extreme kurtosis indicative of heavy tails in their distributions, particularly mining and oil, and services. Low mean and median returns are also noted in all markets especially in the property and services sectors. Highest average return was registered by the mining and oil sector with close to 0.6 percent, with the holding firms following with a little less than 0.4 percent. The mean performance of other sectors hovers to just a shade over 0.2 percent. Services proved to have the lowest average return with less than 0.2 percent for the entire sample horizon. The Lagrange multiplier ARCH (14) tests reveal the presence of highly significant ARCH effects in the returns of the sub-indices of the PSE with the exception of the services sector. Thus in most submarkets, time-varying return volatility exists, justifying the use of the heteroscedatic null in the VR tests.

Returns in the different submarkets of the PSE are all positive and are highly correlated as evidenced by the correlation matrix in Table 3 where all pair-wise correlation coefficients of returns are highly significant statistically. The implication of these empirical signals may be that all submarkets of the exchange are moving together in more or less the same direction and may react similarly to the same impulses and shocks.

Figure 1. Line graphs of the weekly PSE all shares and the different sectoral indices

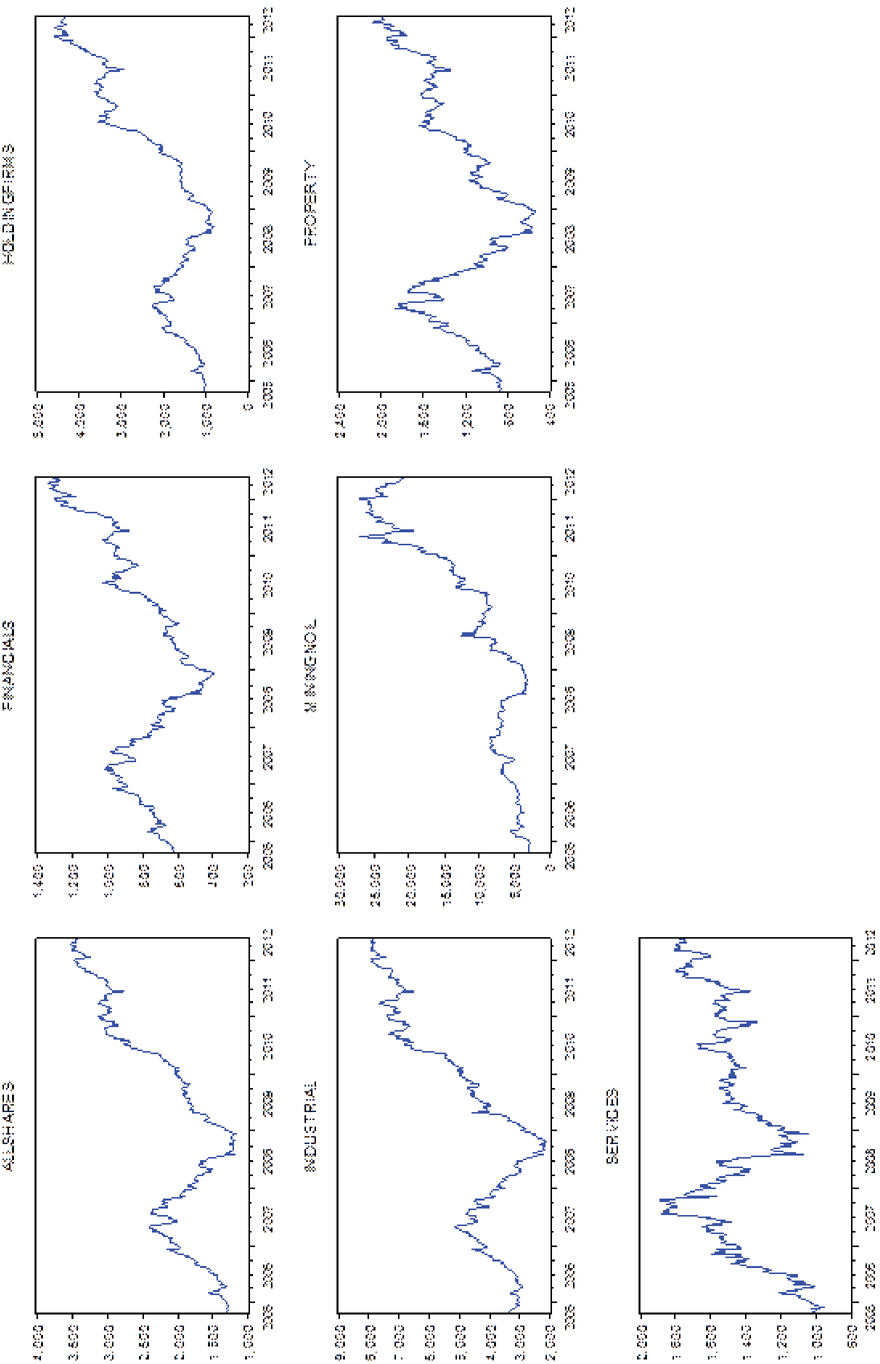

Table 2. Descriptive statistics of returns in PSE submarkets

Descriptives	ALL SHARES	FINANCIALS	HOLDINGS	INDUSTRIALS	MINING & OIL	PROPERTY	SERVICES
Mean	0.002888	0.002199	0.004282	0.002506	0.005764	0.002406	0.001662
Median	0.003358	0.003281	0.005554	0.002032	0.004759	3.51E-05	0.001789
Maximum	0.105948	0.145315	0.136561	0.165353	0.308515	0.144701	0.116975
Minimum	-0.125307	-0.149463	-0.161477	-0.098610	-0.267731	-0.146325	-0.163705
Std. dev.	0.027662	0.034015	0.040231	0.032377	0.059340	0.042564	0.034371
Skewness	-0.452091	-0.310925	-0.189882	0.265353	0.127092	-0.152394	-0.531467
Kurtosis	5.309072	5.914447	4.578974	6.186662	7.802002	4.284176	6.371238
ARCH (14)	32.8479	35.4334	52.469	35.2479	40.1357	45.9658	13.8122
p-value	0.003030	0.001268	0.000002	0.001351	0.000243	0.000003	0.463796
Jarque-Bera	87.62836	126.5500	37.58267	148.7196	329.5146	24.82355	178.0549
p-value	0.000000	0.000000	0.000000	0.000000	0.000000	0.000004	0.000000

Table 3. Correlation of returns across sectoral markets of the PSE

Correlation t-Statistic	ALL SHARES	FINANCIALS	HOLDINGS	INDUSTRIALS	MINING & OIL	PROPERTY	SERVICES
ALL SHARES	1.000000						

FINANCIALS	0.847219	1.000000					
	29.40639***	-----					
HOLDINGS	0.886030	0.798810	1.000000				
	35.23864***	24.48430***	-----				
INDUSTRIALS	0.828700	0.705787	0.715791	1.000000			
	27.30148***	18.37044***	18.90056***	-----			
MINING & OIL	0.594019	0.506556	0.521722	0.450741	1.000000		
	13.61572***	10.83315***	11.27642***	9.310701***	-----		
PROPERTY	0.877082	0.789032	0.837656	0.685018	0.533570	1.000000	
	33.66904***	23.68191***	28.27843***	17.33789***	11.63284***	-----	
SERVICES	0.773267	0.591609	0.589164	0.552792	0.460451	0.599245	1.000000
	22.48663***	13.53064***	13.44490***	12.23178***	9.564546***	13.80217***	-----

*** p-value < 0.001

3.2. Results from the unit root tests

As mentioned in the methodology section, one of the two preconditions of a weak-form efficient market is the presence of the unit root component in the price series. The existence of a unit root in a variable implies its nonstationarity such that either the variable's first or the second moment or both are time varying. The presence of a single unit root in the market price series indicates its potential of being a random walk, especially when its first difference or its logarithmic first difference is a white noise. These first differences are frequently equated respectively, to the simple and continuously compounded return of the underlying financial series. When the returns are a white noise, then it cannot be predicted reliably; hence, the best prediction of the actual value of the series on the next period is the actual value during the current period—a time-honored hallmark of an informationally efficient market.

The information provided by Tables 4 and 5 concerns the results of the testing for the occurrence of unit roots in the various sectoral index series. Table 4 details the results of the augmented Dickey-Fuller (ADF) test on the individual indices under two exogenous regression scenarios of the presence of the drift parameter (intercept) and the presence of both intercept and trend in the auxiliary regressions. Under the two scenarios, the results are unmistakable: all sectoral indices, including the all-shares index, are integrated of order one—in other words, have single unit root, nonstationary at levels but stationary at first differences, at the highest level of significance. This result is somewhat encouraging for academicians who believe that the markets are informationally efficient.

Table 4. ADF unit root test for the sectoral indices of the PSE

Sector	With intercept		With intercept and trend	
	Level (p-value)	First difference (p-value)	Level (p-value)	First difference (p-value)
Null hypothesis: With unit root				
All shares	0.9531	0.0000	0.9374	0.0000
Financials index	0.9534	0.0000	0.9725	0.0000
Industrial index	0.9624	0.0000	0.8685	0.0000
Holding firms index	0.9843	0.0000	0.9488	0.0000
Property index	0.8364	0.0000	0.9124	0.0000
Services index	0.1354	0.0000	0.2701	0.0000
Mining & oil index	0.8862	0.0000	0.7773	0.0000

Figures presented in Table 5 reveal the additional unit root assessment, this time courtesy of the panel unit root tests. These tests are used to check if the results of the individual ADF tests for the different sectors are robust to panel data structure. Furthermore, the literature points out the superiority of panel-based unit root tests (e.g., Wu and Chen [1999]; Azad [2009]) in terms of power vis-à-vis unit root tests based on individual time series. Tests by Levin, Lin, and Chu [2002], Breitung [2000], and Hadri [2000] assume common unit root process across different cross section entities, while the Im, Pesaran and Shin [2003], and the Fisher-type tests [Maddala and Wu 1999] assume different unit root processes for the different cross-section units. The results from these tests confirm the findings of the tests for the individual ADF unit root test that all sectoral indices of the PSE are integrated of order one; therefore, it is safe to conclude that the all-shares index, which represents the PSE itself and the six sectoral submarkets, exhibits unit root components.

Table 5. Panel unit root tests on the PSE sectoral indices

Panel unit root test: Level variables				
Series: ALLSHARES, FINANCIALS, HOLDINGFIRMS, INDUSTRIAL, MINING&OIL, PROPERTY, SERVICES				
Method	Statistic	Prob.**	Cross- sections	Obs
Null: Unit root [assumes common unit root process]				
Levin, Lin, and Chu t	2.25988	0.9881	7	2366
Breitung	-0.51647	0.3028	7	2366
Hadri*	14.1947	0.0000	7	2366
Im, Pesaran, and Shin W-stat	2.87689	0.9980	7	2366
ADF - Fisher Chi-square	4.32045	0.9932	7	2366
PP - Fisher Chi-square	4.93746	0.9867	7	2366

Panel unit root test: first differences				
Method	Statistic	Prob.**	Cross- sections	Obs
Null: Unit root [assumes common unit root process]				
Levin, Lin, and Chu t	-2.55057	0.0054	7	2359
Breitung	-31.8023	0.0000	7	2359
Hadri*	1.49116	0.0680	7	2359
Im, Pesaran, and Shin W-stat	-18.8072	0.0000	7	2359
ADF - Fisher Chi-square	346.840	0.0000	7	2359
PP - Fisher Chi-square	1018.92	0.0000	7	2359

* Hadri's null is stationarity.

** Probabilities for Fisher tests are computed using an asymptotic Chi. -square distribution. All other tests assume asymptotic normality.

3.3. Results from variance ratio tests

In order to ascertain the presence of independent increments for different holding periods (q) of the underlying indices of the PSE, the variance ratio tests expounded in the methodology section are implemented on the weekly stock market data.Two sets of variance ratio tests are used: the robust version of the Lo-McKinlay [1988] test under asymptotic normality, and the wild bootstrap variance ratio test of Kim [2006]. Multiple variance ratio tests via the Chow-Denning [1993] framework are also implemented to mitigate the size bias of the preceding individual VR tests and produce more robust results. Two different null hypotheses are also considered for the variance ratio tests: (1) *the underlying series is a martingale*, and (2) *the logarithmic transformed series is a martingale*. These hypotheses will determine if the series is either a random walk or an exponential random walk, or both. Under the foregoing conditions, two tables are created: Table 6, which details the results of the variance ratio and multiple variance ratio tests to test the null hypotheses under the MDS assumption using asymptotic normality, and Table 7 using the wild bootstrap procedure of Kim [2006].

Evidence presented by the results suggests the presence of overall informational efficiency in the Philippine Stock Exchange during the review period. Generally, the tests are consistently meeting the requirements of both the random walk and the exponential random walk hypotheses for the PSE (all-shares) and all of its sectoral markets. Out of a total of 112 individual variance ratios presented in Tables 6 and 7, only one comes close to being statistically significant at 5 percent level: the $q = 16$ weeks holding period for the holding firms sector shown in Table 7, with wild bootstrap p-value of 0.0550 (significant at 10 percent level for exponential random walk). In all of the 28 Chow-Denning multiple variance ratios, not even one breached the 10 percent level of significance. Hence, it is safe to conclude that under conditional volatility of market returns (m.d.s. hypothesis), regardless of whether the q-period variance ratio distribution is assumed asymptotic normal or nonparametrically resampled through wild bootstrap, the Philippine Stock Exchange adheres to the tenets of the weak-form efficiency market hypothesis during an era of massive modernization.

Table 6. Variance ratio and multiple variance ratio tests using asymptotic normal

Ho: All shares is a martingale					Ho: log [All shares] is a martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	1.0373	1.1269	1.1950	1.3819	Var. ratio	1.0277	1.1427	1.2671	1.5461
Std. error	0.0559	0.1120	0.1730	0.2516	Std. error	0.0784	0.1431	0.2117	0.2924
z-Statistic	0.6677	1.1331	1.1269	1.5179	z-Statistic	0.3528	0.9973	1.2620	1.8680
P-value	0.5043	0.2572	0.2598	0.1290	P-value	0.7480	0.3210	0.2020	0.0770
Chow-Denning Max |Z| =1.5179 [p = 0.4246]					Chow-Denning Max |Z| = 1.8679 [p = 0.2251]				
Ho: Financials is a martingale					Ho: log [Financials] is a martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	1.0048	1.0351	1.1398	1.2414	Var. ratio	0.9428	1.0379	1.1799	1.2840
Std. error	0.0565	0.1066	0.1698	0.2504	Std. error	0.0718	0.1365	0.2114	0.2987
z-Statistic	0.0844	0.3291	0.8234	0.9641	z-Statistic	-0.7969	0.2779	0.8511	0.9509
P-value	0.9327	0.7421	0.4103	0.3350	P-value	0.4255	0.7811	0.3947	0.3416
Chow-Denning Max |Z| = 0.9641 [p = 0.8045]					Chow-Denning Max |Z| = 0.9509 [p = 0.8121]				
Ho: Holding firms is a martingale					Ho: log [Holding firms] is a martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	0.9924	1.1185	1.2644	1.4571	Var. ratio	1.0278	1.2247	1.4113	1.5925
Std. error	0.0588	0.1150	0.1809	0.2640	Std. error	0.0746	0.1412	0.2142	0.2996
z-Statistic	-0.1301	1.0305	1.4613	1.7313	z-Statistic	0.3728	1.5909	1.9203	1.9774
P-value	0.8965	0.3028	0.1439	0.0834	P-value	0.7093	0.1116	0.0548	0.0480
Chow-Denning Max |Z| =1.7313 [p = 0.2942]					Chow-Denning Max |Z| = 1.9774 [p = 0.1786]				
Ho: Industrials is a martingale					Ho: log [Industrials] is a martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	1.0169	1.0180	1.0193	1.2022	Var. ratio	0.9978	1.0189	1.1095	1.4844
Std. error	0.0655	0.1204	0.1755	0.2499	Std. error	0.0831	0.1491	0.2157	0.3002
z-Statistic	0.2576	0.1492	0.1097	0.8092	z-Statistic	-0.0262	0.1270	0.5077	1.6138
P-value	0.7967	0.8814	0.9126	0.4184	P-value	0.9791	0.8989	0.6117	0.1066
Chow-Denning Max |Z| = 0.8092 [p = 0.8856]					Chow-Denning Max |Z| = 1.6138 [p = 0.3628]				

Table 6. con't.

Ho: Mining and oil is a martingale					Ho: log [Mining and oil] is a martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	1.0447	1.1064	1.0934	1.0720	Var. ratio	1.0342	1.2362	1.3410	1.4137
Std. error	0.0931	0.1771	0.2699	0.3724	Std. error	0.0891	0.1574	0.2279	0.3042
z-Statistic	0.4802	0.6006	0.3460	0.1935	z-Statistic	0.3836	1.5001	1.4959	1.3597
P-value	0.6311	0.5481	0.7294	0.8466	P-value	0.7013	0.1336	0.1347	0.1739
Chow-Denning Max |Z| = 0.6006 [p = 0.9583]					Chow-Denning Max |Z| = 1.5001 [p = 0.4365]				
Ho: Property firms is a martingale					Ho: log [Property firms] is a martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	0.9863	1.0961	1.1834	1.1755	Var. ratio	1.0289	1.1997	1.3466	1.3666
Std. error	0.0596	0.1143	0.1779	0.2640	Std. error	0.0672	0.1308	0.2008	0.2817
z-Statistic	-0.2293	0.8411	1.0312	0.6648	z-Statistic	0.4302	1.5268	1.7262	1.3014
P-value	0.8186	0.4003	0.3024	0.5062	P-value	0.6671	0.1268	0.0843	0.1931
Chow-Denning Max |Z| = 1.0312 [p = .7632]					Chow-Denning Max |Z| = 1.7262 [p = 0.2969]				
Ho: Services is a martingale					Ho: log [Services] is a martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	0.9103	0.8506	0.7663	0.7164	Var. ratio	0.9084	0.8200	0.7272	0.6908
Std. error	0.0680	0.1210	0.1792	0.2538	Std. error	0.0680	0.1223	0.1822	0.2593
z-Statistic	-1.3204	-1.2347	-1.3041	-1.1173	z-Statistic	-1.3474	-1.4718	-1.4969	-1.1924
P-value	0.1867	0.2169	0.1922	0.2639	P-value	0.1779	0.1411	0.1344	0.2331
Chow-Denning Max |Z| = 1.3204 [p = 0.5625]					Chow-Denning Max |Z| = 1.4969 [p = 0.4387]				

Table 7. Variance ratio and multiple variance ratio tests using wild bootstrap

Ho: All shares is a martingale					Ho: log [all shares] is a martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	1.0373	1.1269	1.1950	1.3819	Var. ratio	1.0277	1.1427	1.2671	1.5461
Std. error	0.0559	0.1120	0.1730	0.2516	Std. error	0.0784	0.1431	0.2117	0.2924
z-Statistic	0.6677	1.1331	1.1269	1.5179	z-Statistic	0.3528	0.9973	1.2620	1.8680
P-value	0.5080	0.2600	0.2670	0.1220	P-value	0.7480	0.3210	0.2020	0.0770
Chow-Denning Max |Z| = 1.5179 [p = 0.2960]					Chow-Denning Max |Z| = 1.8679 [p = 0.1450]				
Ho: Financials is a martingale					Ho: log [Financials] is a martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	1.0048	1.0351	1.1398	1.2414	Var. ratio	0.9428	1.0379	1.1799	1.2840
Std. error	0.0565	0.1066	0.1698	0.2504	Std. error	0.0718	0.1365	0.2114	0.2987
z-Statistic	0.0844	0.3291	0.8234	0.9641	z-Statistic	-0.7969	0.2779	0.8511	0.9509
P-value	0.9300	0.7550	0.4140	0.3170	P-value	0.4690	0.7810	0.3740	0.3150
Chow-Denning Max |Z| = 0.9641 [p = 0.6290]					Chow-Denning Max |Z| = 0.9509 [p = 0.6370]				
Ho: Holding firms is a martingale					Ho: log [Holding firms] is martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	0.9924	1.1185	1.2644	1.4571	Var. ratio	1.0278	1.2247	1.4113	1.5925
Std. error	0.0588	0.1150	0.1809	0.2640	Std. error	0.0746	0.1412	0.2142	0.2996
z-Statistic	-0.1301	1.0305	1.4613	1.7313	z-Statistic	0.3728	1.5909	1.9203	1.9774
P-value	0.8800	0.3050	0.1450	0.0880	P-value	0.7380	0.1160	0.0620	0.0550
Chow-Denning Max |Z| = 1.7313 [p = 0.2210]					Chow-Denning Max |Z| = 1.9774 [p = 0.1410]				
Ho: Industrials is a martingale					Ho: log [Industrials] is a martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	1.0169	1.0180	1.0193	1.2022	Var. ratio	0.9978	1.0189	1.1095	1.4844
Std. error	0.0655	0.1204	0.1755	0.2499	Std. error	0.0831	0.1491	0.2157	0.3002
z-Statistic	0.2576	0.1492	0.1097	0.8092	z-Statistic	-0.0262	0.1270	0.5077	1.6138
P-value	0.8260	0.8840	0.8940	0.4320	P-value	0.9840	0.9000	0.6010	0.0960
Chow-Denning Max |Z| = 0.8092 [p = 0.7320]					Chow-Denning Max |Z| = 1.6138 [p = 0.2180]				

Table 7. con't.

Ho: Mining and oil is a martingale					Ho: log [Mining and oil] is a martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	1.0447	1.1064	1.0934	1.0720	Var. ratio	1.0342	1.2362	1.3410	1.4137
Std. error	0.0931	0.1771	0.2699	0.3724	Std. error	0.0891	0.1574	0.2279	0.3042
z-Statistic	0.4802	0.6006	0.3460	0.1935	z-Statistic	0.3836	1.5001	1.4959	1.3597
P-value	0.6880	0.5770	0.7340	0.8480	P-value	0.7360	0.1410	0.1340	0.1740
Chow-Denning Max |Z| = 0.6006 [p = 0.8460]					Chow-Denning Max |Z| = 1.5001 [p = 0.2760]				
Ho: Property firms is a martingale					Ho: log [Property firms] is a martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	0.9863	1.0961	1.1834	1.1755	Var. ratio	1.0289	1.1997	1.3466	1.3666
Std. error	0.0596	0.1143	0.1779	0.2640	Std. error	0.0672	0.1308	0.2008	0.2817
z-Statistic	-0.2293	0.8411	1.0312	0.6648	z-Statistic	0.4302	1.5268	1.7262	1.3014
P-value	0.8340	0.3980	0.3130	0.5450	P-value	0.6820	0.1320	0.0850	0.1990
Chow-Denning Max |Z| = 1.0312 [p = 0.5900]					Chow-Denning Max |Z| = 1.7262 [p = 0.2030]				
Ho: Services is a martingale					Ho: log [Services] is a martingale				
Period [q]	q = 2	q = 4	q = 8	q = 16	Period [q]	q = 2	q = 4	q = 8	q = 16
Var. ratio	0.9103	0.8506	0.7663	0.7164	Var. ratio	0.9084	0.8200	0.7272	0.6908
Std. error	0.0680	0.1210	0.1792	0.2538	Std. error	0.0680	0.1223	0.1822	0.2593
z-Statistic	-1.3204	-1.2347	-1.3041	-1.1173	z-Statistic	-1.3474	-1.4718	-1.4969	-1.1924
P-value	0.1930	0.2240	0.1980	0.2780	P-value	0.2120	0.1370	0.1360	0.2450
Chow-Denning Max |Z| = 1.3204 [p = 0.4330]					Chow-Denning Max |Z| = 1.4969 [0.2830]				

4. Concluding remarks

This study has explored the weak-form efficiency of the Philippine Stock Exchange using modern variants of the panel unit root tests and variance ratio tests. The research is motivated by the lack of consensus in the literature on the informational efficiency of the country's stock market and the apparent scarcity of studies on the same issue using data covering the period of massive modernization of the exchange, geared toward transparent disclosures (e.g., the round-the-clock online disclosure system) and integrity of transactions (e.g., the state-of-the-art computerized surveillance system).The study may also be considered a fitting assessment of the efficacy of these operational improvements that led the PSE in setting the pace for most stock exchanges in Asia in terms of growth levels across key stock market indicators, culminating in a highly successful year 2012.

Despite having a relatively small sample (343 weekly observations) as compared to similar studies in the literature, the study, using robust procedures, is able to generate compelling evidence of the weak-form market efficiency of the PSE—that is, market prices fully and instantaneously reflect all available and relevant information, such that price adjustments are immediate in a way that returns cannot be reliably predicted using historical stock market data.

References

Aquino, R. [2006] "Efficiency of the Philippine stock market", *Applied Economics Letters* **13**: 463–470.

Azad, A. [2009] "Random walk and efficiency tests in the Asia-Pacific foreign exchange markets: evidence from the post-Asian currency crisis data", *Research in International Business and Finance* **23**: 322–338.

Bautista, C. [2001] "Predicting the Philippine stock price index using artificial neural networks", UPCBA Discussion Paper 0107, University of the Philippines, Quezon City.

Binsol, A. and D. Bonzo [1996] "On the application of ARFIMA model to Philippine stock exchange oil index", *The Philippine Statistician* **44–45**: 1–8, 33–48.

Breitung, J. [2000] "The local power of some unit root tests for panel data" in: B. Baltagi, ed., *Advances in econometrics*. Volume 15*: Nonstationary panels, panel cointegration, and dynamic panels*. Amsterdam: JAI Press: 161–178.

Cayanan, A. [1994] "An empirical study on the weak-form efficiency of the Philippine stock market", *Philippine Management Review* **5**(1): 72–82.

Charles, A., O. Darne, and J. Kim [2011] "Small sample properties of alternative tests for martingale difference hypothesis", *Economics Letters* **110**: 151–154.

Chow, K. and K. Denning [1993] "A simple multiple variance ratio test", *Journal of Econometrics* **58**: 385–401.

CNNMoney [2013] "World's top 10 performing stock markets in 2012", cnnmoney.com.

Darrat, A. and M. Zhong [2000] "On testing the random walk hypothesis: a model comparison approach", *Financial Review* **35**: 105–124.

Efron, B. [1979] "Bootstrap methods: another look at the jacknife", *Annals of Statistics* **7**: 1–26.

Escanciano, A. and I. Lobato [2009] "Testing for martingale hypothesis" in: K. Patterson and T. Mill, eds., *Palgrave handbook of econometrics*. Palgrave, McMillan.

Fama, E. [1965] "The behavior of stock market prices", *Journal of Business* **38**: 34–105.

Gregorio, R. and C. Saldaña [1990] "The relative efficiency of stock market trading rules based on sock price charts", *Philippine Management Review*.

Hadri, K. [2000] "Testing for stationarity in heterogeneous panels", *Econometric Journal* **3**: 148–161.

Hamid, K., S. Shah, and R. Akash [2010] "Testing the weak form of efficient market hypothesis: empirical evidence from Asia-Pacific markets", *International Research Journal of Finance and Economics* **58**: 121–133.

Hoque, K., J. Kim, and C. Pyun [2007] "A comparison of variance ratio tests of random walks: a case of Asian emerging stock markets", *International Review of Economics and Finance* **16**: 488–502.

Huang, B. [1995] "Do Asia stock market prices follow random walks? Evidence from variance ratio tests", *Applied Financial Economics* **5**: 251–256.

Im, K., M. Pesaran, and Y. Shin [2003] "Testing for unit roots in heterogeneous panels", *Journal of Econometrics* **115**: 53–74.

Kawakatsu, H. and M. Morey [1999] "An empirical examination of financial liberalization and the efficiency of emerging market stock prices", *Journal of Financial Research* **22**: 385–411.

Kim, J. [2006]. "Wild bootstrapping variance ratio tests", *Economics Letters* **92**: 38–43.

Kim, J. and A. Shamsuddin [2008] "Are Asian stock markets efficient? Evidence from new multiple variance ratio tests", *Journal of Empirical Finance* **15**: 518–532.

Levin, A., C. Lin, and C. Chu [2002] "Unit root tests in panel data: asymptotic and finite-sample properties", *Journal of Econometrics* **108**: 1–24.

Liu, C. and J. He [1991] "A variance ratio test of random walk in foreign exchange rates", *The Journal of Finance* **46**(2): 773–785.

Lo, A. [2004] "Adaptive market hypothesis", *Journal of Portfolio Management*. 30th Anniversary Issue: 15–29.

Lo, A. and C. McKinlay [1988] "Stock market prices do not follow random walks: evidence from a simple specification test", *Review of Financial Studies* **1**: 41–66.

Maddala, G. and S. Wu [1999] "A comparative study of unit root tests with panel data and a new simple test", *Oxford Bulletin of Economic Statistics* **61**: 631–652.

Mammen, E. [1993] "Bootstrap and wild bootstrap for high dimensional linear models", *Annals of Statistics* **21**: 255–285.

Melvin, M. [2004] *International money and finance*. 7th edition. Boston: Pearson Addison-Wesley: 103–104.

Samuelson, P. [1965] "Proof that properly anticipated prices fluctuate randomly", *Industrial Management Review* **6**: 41–49.

Smith, G., K. Jefferis, and H. Ryoo [2002] "African stock markets variance ratio tests of random walks", *Applied Financial Economics* **12**: 475–484.

Stoline, M. and H. Ury [1979] "Tables of studentized maximum modulus distribution and an application to multiple comparison among means", *Technometrics* **21**: 87–93.

Wu, J., and S. Chen [1999] "Are real exchange rates stationary based on panel unit root tests? Evidence from Pacific basin countries", *Journal of Financial Economics* **4**: 243–252.

Yilmaz, K. [2003] "Martingale property of exchange rates and central bank intervention", *Journal of Business and Economic Statistics* **21**: 383–395.

Appendix A. Modernization moves of the Philippine Stock Exchange 2005–2010

2005	Implemented the online disclosure system or the ODiSy, providing 24/7 online system access for the submission and announcement of all types of disclosures. Signed a memorandum of agreement with Globetronics Inc., an electronic billboard operator, for the posting and display of the PSE's advertisements in select and strategic locations in Metro Manila through a video display system. FTSE International Limited (FTSE) and Association of Southeast Asian Nations (ASEAN) exchanges, Jakarta Stock Exchange, Bursa Malaysia Berhad, Singapore Exchange Securities Trading Limited, and The Stock Exchange of Thailand signed a memorandum of agreement creating the FTSE/ASEAN Index. The PSE has 12 representative listed companies from the total of 180 traded in the FTSE/ASEAN Index. Implemented a new industry classification of listed companies whereby listed firms are now categorized according to major sources of revenue instead of their primary purpose as stated in their articles of incorporation. Added a new criterion, tradability, for listed companies to be included in the Composite Index. Under this new criterion, shares of companies must be traded in at least 95 percent of the total trading days of the relevant review period of one year.
2006	Revised the industry classification of listed companies by categorizing companies according to their major source of revenue. The number of sectors increased to six from five, with two new sectors introduced—namely, the Holding Firms and Services Sector—while the Mining Sector and the Oil Sector were combined to form just one sector. Shifted to use free float market capitalization in computing the index from the use of full market capitalization of listed stocks. The shift aimed to provide investors with a more reliable gauge of trading activity and market behavior. Revised its criteria in selecting companies for inclusion in the index. The criteria were the following: (1) free float level of at least 10 percent, (2) liquidity or average daily trading value of at least PHP 5 million, (3) tradability of at least 95 percent, and (4) volume turnover ratio of at least 10 percent. The PSE changed the name of its main indicator from PSE Composite Index to PSE Index (PSEi). Migrated from trade-for-trade processing to a multilateral netting system called central clearing and central settlement system (CCCS).

2006	The Commission on Higher Education Commission (CHED) en banc approved the policies, standards, and guidelines for business administration by virtue of CHED Memorandum Order 39 (CMO 39), series of 2006, which mandated the inclusion in business administration courses of a stand-alone subject in capital markets. CMO 39 was implemented in June 2007. The FTSE/ASEAN 40 exchange-traded fund (ETF) was officially launched with its listing on the Singapore Exchange. The ETF was designed to track the 40 largest companies across five stock markets within the ASEAN region. Launched the Certified PSE Securities Specialist Course, which is envisioned to provide continuing education for market participants, while synthesizing and emulating the chartered financial analyst.
2007	Acquired the advanced warning and control system, a state-of-the-art computerized surveillance system designed to further enhance the integrity of the stock market. The Philippine Mineral Reporting Code (PMRC) was formally launched. Considered an internationally accepted standard in the mining industry, the PMRC sets out the minimum requirements, recommendations, and guidelines for public reporting of exploration results, mineral resources, and ore reserves.
2008	Entered into a memorandum of understanding with NYSE Euronext, and signed the new trading system license, implementation and maintenance agreement with NYSE Euronext Technology SAS (NYXT). NYXT is a wholly owned subsidiary of NYSE Euronext, the world's largest exchange operator. The Personal Equity and Retirement Account (PERA) Law was signed by President Gloria Macapagal-Arroyo on 22 August. The PERA Law encourages savings through voluntary retirement funds for workers and provides an important savings and investment vehicle to attract much-needed local investments by resident and overseas Filipinos. Approved the implementation of a circuit breaker rule, a 15-minute trading halt in the event the PSEi declines by at least 10 percent based on the previous day's closing index value, to allow investors time to digest the impact of an unusual market drop and help restore normalcy in the stock market. President Arroyo signed into law Republic Act 9510, otherwise known as the Credit Information System Act (CISA), on 31 October. CISA seeks to enhance the reliability of credit information and facilitate credit investigation and rating.

2009	Signed a memorandum of agreement with the Department of Education on 15 January for the integration of a capital markets segment in the high school curriculum, particularly in the fourth year economics subject. On 30 June, President Arroyo signed into law Republic Act 9648, which exempts from documentary stamp tax the sale, barter, or exchange of shares of stock listed and traded through the stock exchange, with retroactive effect to 20 March 2009. The Real Estate Investment Trust (REIT) Act of 2009 lapsed into law on December 17. The REIT Law encourages the establishment of REIT companies solely for the purpose of owning income-producing real estate and related assets. REIT companies are required to distribute at least 90 percent of their taxable net income to its shareholders to avail themselves of the preferential tax treatment.
2010	Revised its rules on listing by way of introduction on 24 March. The amendments include, among others, the following additional requirements: (1) fairness opinion and valuation report issued by a third-party financial institution on the pricing of the applicant company's securities to be listed in accordance with the Guidelines for Fairness Opinions and Valuation Reports, (2) enhanced lockup provisions, and (3) lifting of the trading band on the listing date of the securities. The PSE's new trading system, now known as PSEtrade, was launched on 26 July.
2010	The corporate governance (CG) guidebook was launched in November as another initiative of the Exchange to promote good governance among listed companies. It is composed of ten guidelines embodying principles of good business practice and based on internationally recognized corporate governance codes and best practices. The Amended Minimum Public Ownership (MPO) Rule took effect on 30 November and became a continuing listing requirement for listed companies. The amended MPO rule states that listed companies must maintain 10 percent, at the minimum, of their issued and outstanding shares held by the public, excluding any treasury shares.

Source: Lifted verbatim from the Philippine Stock Exchange website: www.pse.com.ph.