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Article abstract

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RÉSUMÉ

Cet article utilise les récents développements de l'économétrie des panels dynamiques non stationnaires afin d'examiner la relation entre une mesure de performance externe, à savoir la valeur marchande ajoutée par action (VMA) et cinq mesures connues de performance interne que sont le bénéfice par action (BPA), le flux monétaire libre par action (FML), la valeur économique ajoutée par action (VÉA), le rendement de l'actif (ROA) et le rendement des capitaux propres (ROE). L'analyse consiste à tester l'existence d'une relation dynamique d'équilibre à long terme (i.e., une relation de cointégration) entre la VMA et les cinq mesures de performance interne sélectionnées. Plusieurs tests de stationnarité et deux tests de cointégration sur données de panel (Kao (1999) et Pedroni (2004)) sont appliqués sur un échantillon de 24 entreprises opérant dans le secteur des assurances aux États-Unis pour la période 1991-2004. Nos principaux résultats indiquent que les relations de cointégration les plus statistiquement significatives sont celles qui lient la VMA et la VÉA de même que la VMA et le ROA. Enfin, une analyse de robustesse via l'estimation des modèles à correction d'erreurs sur données de panel (ECMP) et une analyse comparative des résultats de la cointégration versus ceux de la corrélation supportent les résultats obtenus et les explications fournies.

Mots clés : Création de valeur, performance, cointégration, corrélation.

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ABSTRACT

This article relies on recent developments in econometrics of non-stationary dynamic panel data in order to examine the linkages between a firm's market value added (MVA) per share, a measure of its external performance, and well-established internal performance measures. Indeed, several panel unit root tests and two panel cointegration tests [namely Kao (1999) and Pedroni (2004)] are applied on a sample of 24 firms from the U.S. insurance industry over the period 1991-2004 to test for the existence of a long-term equilibrium relationship between MVA and the following five internal performance measures: earnings per share (EPS), free cash flow per share (FCF), economic value added per share (EVA), return on assets (ROA) and return on equity (ROE). Our main results show that cointegration between MVA and EVA as well as between MVA and ROA are the two more statistically powerful relationships. Several explanations are provided for the above findings supported by robustness analyses using panel error-correction models (PECM) and a comparative analysis of cointegration versus correlation results.

Keywords: Value creation, performance, cointegration, correlation.

1. INTRODUCTION

The performance (financial and non-financial) measurement of the firm is a key responsibility of a Chief Financial Officer and is of crucial importance for all stakeholders. For example, shareholders may wish to rely on relevant indicators of market value creation inside their company vis-à-vis competitors. Likewise, it is essential for managers to translate their strategic decisions into measurable indicators of future performance. For members of the board of directors, it will be imperative to design incentive systems that are performance compatible in order to reduce the agency costs between owner, manager, and other stakeholders (Copeland, Weston and Shastri, 2005).

Of course, this also seems to hold true for insurance companies according to two finance-driven surveys conducted by Pricewaterhouse Coopers LLP in the past few years (PwC, 2008). Indeed, these survey results indicate that "top performing insurance companies align and integrate their key performance indicators (KPIs) with their forward thinking strategic and tactical decision making processes to enhance their bottom line and to give them a substantial edge over their competition" (PwC, 2008, p.1). At the same time, survey results also show that many insurers tend to use too many KPIs. Hence, there is a need for insurers who wish to improve business performance to select and manage the "right" KPIs (PwC, 2008, p.1). One way of helping insurers find the relevant KPIs is by examining the possible relationships between internal and external performance measures such as stock returns, the market value of the firm and/or its market value added (MVA).

Previous empirical studies which have examined these possible relationships have focused on non-financial corporations and have relied on traditional OLS regression models. Even if a few studies have looked at banks (e.g., Uyemura et al., 1996), it appears that the particular case of insurance companies has never been examined. Moreover, these previous studies have not tested the stationarity of the different performance measures on panel data. Thus, the risk of having spurious regression results is very high given that financial variables are known to be statistically non-stationary without first differentiation or more. New developments in econometrics such as panel stationarity tests[1] and panel cointegration tests[2] should allow us to remedy these flaws in making our analysis more robust and more powerful due to a greater number of observations and time periods. In addition to these econometric advantages, cointegration analysis allows us to appreciate both the explanatory power and predictive capacity of each of internal performance measures being tested in order to examine which metric is more value relevant. This, in itself, should be of great practical interest to insurance analysts and investors as well.

The aim of this paper is to use panel cointegration methods in order to test for the existence of a long-term equilibrium relationship between a company's MVA per share, a measure of its external performance, and other well-known internal performance measures for a sample of 24 firms from the U.S. insurance industry over the period 1991-2004. Given the long-term nature of the insurance business, it seems highly logical to pursue this empirical investigation. Our cointegration analyses provide evidence of a stronger and more powerful relationship between MVA and two internal performance measures, namely economic value added per share (EVA) and return on assets (ROA). These results should be of interest to insurance analysts, investors and managers who are eager to find KPI metrics that really matter in terms of value creation.

The remainder of this paper proceeds as follows. Section 2 presents a literature review of the relationship between internal and external performance measures. Section 3 describes our research methodology including: our choice of variables, hypotheses to be tested, the sample and study period. It also explains the several panel unit root tests and the two panel cointegration tests that will be used in the empirical investigation. In section 4, empirical findings are reported. The results of the robustness analyses are presented in section 5. Finally, section 6 provides a conclusion.

2. LITERATURE REVIEW ON PERFORMANCE MEASURES

The relationship between external and internal performance measures has been a topic of increased scrutiny by researchers since the early 90s. Several studies have explored the relationship between MVA and some internal performance indicators at the firm level, such as: earnings per share (EPS), free cash flow per share (FCF), economic value added per share (EVA), return on assets (ROA), return on equity (ROE) and, net operating profit after tax (NOPAT).

Despite the heightened interest in such topic by academics and practitioners, there is an absence of empirical evidence regarding the relationship between external and internal performance measures of insurance companies. In fact, most samples used in these studies have not included financial firms, such as banks and insurance companies[3].

In what follows, we review the most important studies that have documented the relationship between MVA and several internal performance measures. Most of these studies have sought to compare the predictive and explanatory power of EVA versus other traditional accounting measures in order to explain market value. The results of these studies have been controversial and inconclusive. Stewart (1991) was the first one to analyse the relationship between EVA and market value creation. Using a sample of 613 US companies for the period 1984-1985 compared to the period 1987-1988, Stewart found a strong relationship between EVA and MVA, both for average values and for changes in values over time. Uyemura, Kantor and Pettit (1996) studied the relationship between EVA and MVA in the particular case of financial institutions. Based on a sample of 100 large bank holding companies for the period 1986-1995, these authors compared the correlation between five internal performance measures (EPS, Net Income (NI), ROE, ROA and EVA) and MVA, as the external performance measure. Their results show a high correlation between EVA and MVA. O'Byrne (1996) studied the information content of EVA and NOPAT embedded into a firm's share price. Based on a sample of 6551 firm-year observations covering the period 1985-1993, the author argued that EVA, unlike other earnings measures including NOPAT, is systematically linked to market value and that it is a powerful tool for understanding investors' expectations built into a company's current share price. Lehn and Makhija (1997) studied the relationships between six internal performance measures and firms' stock returns. Using a sample of 452 US companies for the period 1985-1994, these authors found that the correlation between EVA and stock returns is higher than for the other tested performance measures.

There are other studies which have shown a strong relationship between EVA and market value: examples include Finegan (1991), Stern (1993), Grant (1996), Miluonovich and Tsuei (1996), Bao and Bao (1998), Goldberg (1999), and many others. However, some previous studies have found conflicting results. Chen and Dodd (1996) studied the correlation between stock returns and five internal performance measures, namely, EPS, Residual Income (RI), ROA, ROE and EVA. Using a sample of 566 US companies for the ten-year period 1983-1992, these authors argued that RI and EPS display a greater ability to explain stock returns than EVA. Biddle, Bowen and Wallace (1997) studied the relationship between adjusted stock returns and four internal performance measures namely, EVA, RI, cash flows from operations (CFO) and earnings excluding special items. Their sample included 773 companies for the period 1984-1993, which means 6174 firm-year observations. These authors concluded that earnings reflect stock returns better than EVA. Kramer and Pushner (1997) studied the strength of the relationship between EVA and MVA, using Stern and Stewart's 1000 companies over the period 1982-1992. Their results show no evidence that EVA is superior to NOPAT in its association with MVA. There are a few other studies which have shown no clear evidence to support the general idea that EVA is the best internal performance measure of shareholder value creation. Examples include Olsen (1996), Young (1999), Keys, Azamhuzjaev and Mackey (2001), Turvey and Sparling (2003), and Kim (2006).

Finally, it should be noted that the few studies testing for the existence of a cointegration relationship between external and internal performance measures join a new and emergent stream of research which are tied to recent developments in the econometrics of dynamic panel data. Three Asian studies belong to this emerging type of research. First, Oh, Kim and Kim (2006) studied the long-run equilibrium relationship between stock price and earnings-per-share using panel data on the Korean stock market. Based on a sample of 140 Korean companies over the period 1981-2000, these authors found that stock prices and earnings per share are indeed cointegrated. Second, Su, Chang, Chang and Wei (2007) relied upon the panel unit root tests and the panel cointegration tests to determine whether a long-run dynamic equilibrium relationship does exist between stock prices and dividends per share on Taiwan's stock market from June 1991 to February 2005. Their findings support the existence of a weak[4] but significant cointegration relationship between stock prices and dividends per share. Last, Chang et al (2008) also relied on the panel cointegration tests to investigate the relationship between stock prices and earnings-per-share (EPS).

Using quarterly data for 75 firms listed on the Taiwan Stock Exchange (TSEC) for the period 1997-2006, the authors found a significantly strong[5] cointegration relationship between these two variables. It should be noted that the aim of these Asian studies was not the examination of the information content of earnings per share or dividends per share for market value creation, but rather the detection of a mean-reversion phenomenon of stock prices towards their fundamental value (Oh, Kim and Kim (2006) and Chang et al (2008)) while Su et al (2007) meant to study the detection of rational speculative bubbles. To the best of our knowledge, our paper is the first attempt to rely on these powerful methodologies in the particular case of the U.S. insurance industry.

3. RESEARCH METHODOLOGY

3.1 Choice of variables

In this study, we use market value added (MVA) as the external performance measure of each insurance firm included in our sample. Indeed, MVA is one of the market's major indicators of value creation[6]. MVA is defined as the difference between a firm's current market value and its employed capital invested by both its bondholders and its shareholders. A high MVA indicates that the firm has created substantial wealth for its shareholders. A negative MVA means that wealth and value have been destroyed. MVA is also defined as the present value of all future and current EVA (Stewart (1991)). Several authors have considered that MVA is a more relevant measure of market value creation than stock price, given that it assesses an increase in value with regards to the capital invested so far within the firm.

For internal performance measures, we selected the following five measures: EVA, EPS. FCF, ROA and ROE. Two reasons justify this choice of internal performance measures: (1) their wide use in the financial management system as performance metrics, (2) they have been the subject of numerous empirical studies analyzing their explanatory and predictive power for shareholder value creation with mixed results, depending on the sample and the study period. Of course, each selected internal performance measure has strengths and weaknesses.

EVA is the residual income adjusted for accounting distortions that arise from GAAP[7]. According to Danhel and Sosik (2004): "the clarity and understandable interpretation makes EVA a very useful tool for valuation in the insurance industry...The EVA approach enables us to clearly identify the investors requirements and expectations with regard to the risk-reward trade-off. It makes the valuation transparent". Several studies have tried to understand the difference between EVA and other internal performance measures. According to Uyemura, Kantor, and Pettit (1996), O'Hanlon and Peasnell (1996), and Stewart (1994), EVA has many advantages compared to other measures: (1) the adjustments needed to calculate EVA minimize accounting distortions, (2) these adjustments are intended to shift the traditional accounting disclosure to economic value accounting, (3) EVA provides a valuable framework for "converting wrong accounting" numbers into correct estimates of value, (4) EVA can promote investment decisions consistent with the interests of shareholders by solving over-investment and under-investment problems, (5) EVA is more closely correlated with long-term increases in stockholder value than other internal performance measures (6) EVA provides a clear connection between the firm's profitability and its valuation and, (7) EVA takes into account the cost of capital and the amount of adjusted invested capital.

EPS is frequently used by financial analysts for its simplicity and direct link with a firm's price-earnings ratio. However, many authors noticed that past and current EPS cannot be considered as relevant indicators in order to explain a firm's profitability. Arguments often heard against EPS refer to the possibility of its manipulation by management, its ignorance of the cost of generating profits, and the necessity of using it in conjunction with a financial statement analysis and other measures.

FCF is a measure of financial performance calculated as operating cash flow minus capital expenditures. FCF represents the cash that a company is able to generate after laying out the money required to maintain or expand its asset base. FCF is important because it allows a company to pursue opportunities that enhance shareholder value. Without cash, it's difficult to develop new products, make acquisitions, pay dividends and reduce debt. This is a popular measure, but it has weaknesses when used in isolation because it accounts for all capital expenditures, not just maintenance capital expenditures (ie., the amount required to keep existing operations going). In addition, it can also be manipulated.

ROA is a key profitability ratio which measures the amount of profit made per dollar of assets owned by the firm. It measures the company's ability to generate profits (before leverage) with its own assets. ROA can be used to measure the relative efficiency of companies operating within the same industry and with a similar product and/or service line. Since the figure for total assets of the company depends on the carrying value of the assets, some caution is required for companies whose carrying value may not correspond to the actual market value. ROA is a common figure used for comparing performance of financial institutions (such as banks and insurance companies), because the majority of their assets will have a carrying value that is close to their actual market value.

ROE is one of the most important profitability metrics; it measures a firm's efficiency at generating profits from every unit of shareholders' equity. In other words, ROE shows how well a company uses invested funds to generate earnings growth. In general, a high ROE is considered a sign of good management when a company's performance over time is at least as good as the average return on equity for other companies in the same industry. Even though ROA and ROE can give a general view of management efficiency, one should know that they are not perfectly accurate given that earnings can manipulated by management in order to achieve target results.

3.2 Hypotheses Development

The aim of this study is to test the existence of a long-term equilibrium relationship between MVA and the five selected internal performance measures. The existence of a cointegration relationship between MVA and an internal performance measure expresses the ability of the latter to reflect the information conveyed by the financial market and incorporated in the market value of the insurance company. In this study, we consider that there is not a unique performance measure of shareholder value creation. Thus, we assume the existence of dynamic linkages between MVA and the five selected internal performance measures. Therefore, our first hypothesis is the following:

Hypothesis 1 (H1): The five internal performance measures are cointegrated with an insurer's MVA.

By taking into account the strengths and weaknesses of the five selected internal performance measures discussed previously, we can argue that the intensity of their incremental information content for the creation of market value should also differ from one model to another. In other words, the strength of the long-run equilibrium relationship between the two variables of each model [e.g., MVA-EVA] can be different. In this study, we assume that internal performance measures with a high (low) explanatory power are those which have a statistically powerful (weak) cointegration relationship with MVA. In addition, the intensity of the cointegration relationship between

MVA and the internal performance measure informs us about the power of the predictive capacity of the latter[8].

Given the direct link between EVA and MVA, we propose our second hypothesis:

Hypothesis 2 (H2): The cointegration relationship between MVA and EVA is the most powerful one, compared to the other models.

In addition, given that ROA is a relevant internal performance measure for insurance companies due to the nature of their assets, we state our third hypothesis as follows:

Hypothesis 3 (H3): The model (MVA-ROA) presents the second most powerful cointegration relationship, compared to the other models.

Finally, given the well-known shortcomings of a firm's EPS, FCF and ROE, the widespread use of the latter as a way of comparing firms operating in the same industry allows us to claim the following:

Hypothesis 4 (H4): The cointegration relationship between MVA and ROE is more powerful than those of the models (MVA-EPS) and (MVA-FCF).

3.3 Data, sample selection and descriptive statistics

The sample consists of 24 U.S. stock listed insurance-related firms. It includes 15 P&C firms, 4 L&H entities, 3 major brokerage firms and 2 Accident and Health insurers. All of these firms are holdings companies (or groups) with subsidiaries. The frequency of the data is annual and our analysis covers the period 1991-2004. Hence, we obtain 336 year-firm observations. These firms were chosen because their MVA and EVA data information is available in the Stern & Stewart's "2005 US 1000 EVA/MVA Annual Ranking Database" for the entire period. Data for the other required financial variables are obtained from Compustat.

Table 1 presents descriptive statistics of the six performance measures for each year of the study period. Table 2 presents descriptive statistics of variables for pooled data. In interpreting the content of Table 2, we suggest to focus on the case of EVA. As we can see, the average EVA is negative (-18.212) and below both the average EPS (74.298) and average FCF (96.856). This difference is due, firstly, to the important impact of the cost of capital and, secondly, to the corrective accounting adjustments to GAAP, needed to calculate

EVA. In addition, we note that FCF shows the highest average (96.856) as we would normally expect. Also, the average MVA is positive (958.61) which means that, on average, the 24 insurance companies in our sample have created market value. Finally, we can see that, the average ROE is much higher than the average ROA which means that, on average, these companies benefit from financial leverage.

3.4 Methodology and models

Before conducting a panel cointegration analysis, it is required to investigate the stationarity of the variables involved. Hence, in order to apply panel cointegration tests, we should first use panel unit root tests to insure that the variables being analyzed are non-stationary in levels and stationary in their first-differences. Thus, in step one, we shall carry out various panel unit root tests followed by, in step two, regular panel cointegration tests.

In this study, we rely on the most recent developments in the econometrics of non-stationary dynamic panel data. In order to ensure robustness of our results, we conduct a set of panel unit root tests as proposed by Im, Pesaran and Shin (2003), Levin, Lin and Chu (2002), Breitung (2000) and Hadri (2000). The panel unit root test developed by Im, Pesaran and Shin (IPS hereafter) is recognized, among these tests, as the most powerful one. Indeed, the IPS unit root test deals with heterogeneity across members of the panel and also with the impact of serial correlation in the residuals. Hence, this test leads to unbiased results. The IPS unit root test is based on two statistics: a student statistic, , and a maximum likelihood statistic,. These two statistics are obtained by averaging the individual Augmented Dickey-Fuller (ADF) tests. The IPS test takes care of serial correlation automatically given that an appropriate ADF regression will correct the serial correlation problem in the data set. In our empirical investigation, we rely exclusively on the Z_{tbar} statistic, given that Monte Carlo simulations have shown that Z_{tbar} has a better performance compared to Z_{Lbar} when N and T are small.

By contrast, the other panel unit root tests proposed by Levin, Lin, and Chu (LLC hereafter), Breitung, and Hadri assume that there is a common unit root process. So, the autoregressive coefficient of the Dickey-Fuller-type regression is supposed to be identical across all individuals.

The LLC test requires a specification of the number of lags used in each cross-section ADF regression, as well as the Kernel choices used. The exogenous variables used in the test equations must be specified.

The Breitung test requires only a specification of the member of lags used in each cross-section ADF regression and the exogenous regressors. The Breitung test differs from the LLC test in two distinct ways. First, only the autoregressive portion is removed when constructing the standardized proxies. Second, the proxies are transformed and detrended.

The Hadri test is similar to the univariate stationary test of Kwiatkowski, Phillips, Schmidt and Shin (KPSS hereafter) unit root test. The Hadri test is based on a test statistic that is simply the average of the univariate stationary test of KPSS (1992). The Hadri test is based on the residuals from the individual OLS regressions of the dependent variable () on a constant, or on a constant and a trend. Thus, this test requires only the specification of the form of the OLS regressions: whether to include only individual specific constant terms or both constant and trend terms. Finally, the Hadri test has a null hypothesis of no unit root, whereas the IPS, LLC and Breitung tests have a null hypothesis of a unit root.

For the panel cointegration tests, we use two residual-based tests, namely, the Kao (1999) test and the Pedroni (2004) test. Those tests are based on the OLS estimators, and have a null hypothesis of no cointegration. Both the Kao and Pedroni tests are based on regressing a non-stationary variable on a vector of non-stationary variables and therefore, both may suffer from a spurious regression problem. However, after appropriate normalizations, these tests do converge with random variables being normally distributed.

The Kao test considers the spurious regression for the panel data and introduces parametric residual-based panel tests for the null hypothesis of no cointegration. It expands the DF and ADF unit root tests to panel cointegration. The Kao test is based on four different DF type test statistics and one ADF type test statistic. In this study, only the last one will be used. It is based on the average of the *ADF t*-statistic test.

Pedroni (2004) studied the properties of cointegration tests in heterogeneous panels and derived appropriate distributions for these cases. Like the IPS panel unit-root test, the Pedroni test takes heterogeneity into account through the specific parameters for each individual members of the sample. This allows testing for the existence of a long-run equilibrium in multivariate panels, while also permitting the dynamic and even the long-run cointegrating vectors to be heterogeneous across individual members. The Pedroni test has a null hypothesis of no cointegration. It relies on seven different statistics to test for cointegration in panel data. Four of the statistics are based on the within-dimension called panel cointegration statistics [namely, panel v-statistic, panel Rho-statistic, panel PP-statistic and panel ADF-statistic]. The other three statistics are based on the between-dimension, called group-mean panel cointegration statistics, [namely, group Rho-statistic, group PP-statistic and group ADF-statistic].

In order to test for the existence of a long-run dynamic equilibrium relationship between a firm's MVA and the five internal performance measures, we consider the following models:

Model 1: $MVA_{i,t} = \alpha_i + \delta_i t + \beta_i EPS_{i,t} + \varepsilon_{i,t}$

Model 2: $MVA_{i,t} = \alpha_i + \delta_i t + \beta_i FCF_{i,t} + \varepsilon_{i,t}$

Model 3: $MVA_{i,t} = \alpha_i + \delta_i t + \beta_i EVA_{i,t} + \varepsilon_{i,t}$

Model 4: $MVA_{i,t} = \alpha_i + \delta_i t + \beta_i ROA_{i,t} + \varepsilon_{i,t}$

Model 5: $MVA_{i,t} = \alpha_i + \delta_i t + \beta_i ROE_{i,t} + \varepsilon_{i,t}$

With,

- $MVA_{i,t}$ is the market value added per share of insurance firm *i* in year *t*
- $EPS_{i,t}$ is the earning per share of insurance firm *i* in year *t*
- $FCF_{i,t}$ is the free cash-flow per share of insurance firm *i* in year *t*
- $EVA_{i,t}$ is the economic value added per share of insurance firm *i* in year *t*
- $ROA_{i,t}$ is the return on assets of insurance firm *i* in year *t*
- $ROE_{i,t}$ is the return on equity of insurance firm *i* in year *t*
- $i = 1, 2 \ldots N$ and $t = 1, 2 \ldots T$ (*N* and *T* are the sample parameter values, namely, insurance firm and time, respectively).

4. EMPIRICAL ANALYSIS AND RESULTS

Tables 3 and 4 report the results of the panel unit root tests performed on our six variables (MVA, EPS, FCF, ROA, ROE and EVA) for both absolute levels and first differences, respectively.

For absolute levels, the panel unit root tests results indicate the non-stationarity of all six variables. In fact, the IPS as well as the LLC and the Breitung tests fail to reject the null hypothesis of non-stationarity at conventional statistical levels. Moreover, the Hadri test rejects the null hypothesis of stationarity for the six variables at a 1%

significance level. As shown in Table 4, the results of panel unit root tests show that all variables are stationary when tested on their first differences. Indeed, the IPS as well as the LLC and the Breitung tests reject the null hypothesis of non-stationarity at a 1% significance level. In addition, the Hadri test fails to reject the null hypothesis of non-stationarity at conventional significance levels. This means that the prerequisite condition for cointegration analysis is met. This also means that, we can apply the panel cointegration tests proposed by Kao (1999) and Pedroni (2004) on the following five models: (MVA-EPS), (MVA-FCF), (MVA-ROA), (MVA-ROE) and (MVA-EVA).

As mentioned previously, the panel cointegration test developed by Kao is based on the average of the *ADF t*-statistic test. However, Pedroni's panel cointegration test is based on the average of seven statistics: four statistics belong to the within-dimension category and three statistics belong to the between-dimension category. The rejection of the null hypothesis of no cointegration means that a sufficient number of companies have statistics values which indicate the existence of a statistically significant long-run dynamic equilibrium relationship between the two tested variables. In the present study, the rejection of the null hypothesis indicates the existence of a statistically significant cointegration relationship between MVA and the selected internal performance measures.

Previous empirical studies have shown that the Kao and Pedroni tests often lead to conflicting results. For this reason, when interpreting the empirical results we consider the following three cases: (1) if both the Kao and the Pedroni tests indicate non-rejection of the null hypothesis of no cointegration, this means that MVA and the specific internal performance measure being tested, are not cointegrated, (2) if both tests lead to conflicting results, this means that the cointegration relationship between MVA and the specific internal performance measure being testes, is statistically weak and, (3) if both tests indicate rejection of the null hypothesis of no cointegration, this means that the cointegration relationship between MVA and the specific internal performance measure being tested, is statistically strong.

For the second and third cases, we use the number of within-dimension statistics as well as the between-dimension statistics that reject the null hypothesis of no cointegration to compare the statistical intensity of the cointegration relationships among the tested models.

The results for the Pedroni tests are presented in Table 5. In interpreting these results, let us focus on the case of the models (MVA-EVA), (MVA-ROA) and (MVA-FCF). As we can see, all statistics, except the group Rho-statistic, reject the null hypothesis of no cointegration between MVA and each of these three internal performance measures at different significance levels. For the models (MVA-ROE) and (MVA-EPS), the results indicate that only five statistics among seven reject the null hypothesis of no cointegration at a significance level of 1% and 5%. Overall, the results obtained when using the Pedroni tests support the existence of significant cointegration relationships for the following five tested models, namely: (MVA-EPS), (MVA-FCF), (MVA-ROA), (MVA-ROE) and (MVA-EVA).

The results when applying the Kao test, reported in Table 6, show the existence of cointegration relationships only for three models, namely: (MVA-EVA), (MBA-ROA) and (MVA-ROE). In fact, as we can see for these models, the statistics of the Kao test reject the null hypothesis of no cointegration at a 5% significance level. However, for the models (MVA-EPS) and (MVA-FCF), the Kao test does not reject the null hypothesis of no cointegration. This means, that according to the Kao test, the EPS and the FCF do not appear to be statistically and significantly cointegrated with MVA. According to both cointegration tests [Pedroni and Kao], we can then argue in favour of the existence of a statistically strong cointegration relationship for the following three models: (MVA-EVA), (MVA-ROA) and (MVA-ROE). However, for the models (MVA-EPS) and (MVA-FCF), the cointegration relationships appear to be rather statistically weak. Nevertheless, on the whole, these results support hypothesis 1 since the five chosen internal performance measures are statistically and significantly cointegrated with MVA.

Regarding the intensity of the cointegration relationships among the tested models, we can infer that the cointegration relationships for the models (MVA-EVA) and (MVA-ROA) are more powerful than the cointegration relationship for the model (MVA-ROE). In fact, for the models (MVA-EVA) and (MVA-ROA), only one among the seven statistics used by the Pedroni test [ie. the group Rho-statistic] does not reject the null hypothesis of no cointegration. However, two statistics [namely, the panel Rho-statistic and the group Rho-statistic] do not reject the null hypothesis of no cointegration between MVA and ROE. Thus, we can conclude that both hypotheses 2 and 3 are supported by the analysis, given that the models (MVA-EVA) and (MVA-ROA) respectively show the most powerful cointegration relationships when compared to the other tested models.

Using the same line of reasoning based on the use of the Pedroni and the Kao tests, we found a rather weak cointegration relationship for both the (MVA-EPS) and (MVA-FCF) models. In addition, when comparing, one can conclude that the cointegration relationship for the model (MVA-FCF) is slightly more powerful than the one applying to the model (MVA-EPS). Indeed, for the model (MVA-FCF), six among the seven statistics used by the Pedroni test reject the null hypothesis of no cointegration at a significance level of 1% and 10%. However, for the model (MVA-EPS), only five among the seven statistics used by the Pedroni test reject the null hypothesis of no cointegration at a significance level of 1% and 5%. Overall, these results allow us to accept hypothesis 4. Indeed, the model (MVA-ROE) clearly shows a statistically stronger cointegration relationship when compared to the one for the models (MVA-EPS) and (MVA-FCF).[9]

5. ROBUSTNESS ANALYSIS

The robustness analysis consists of two parts, namely, the estimation of the panel error-correction model and the comparative analysis of correlation versus cointegration results.

5.1 Estimation of the panel error-correction model (PECM)

We use the recent developments in the econometrics of non-stationary dynamic panel analysis in order to estimate the panel error-correction model (PECM). Considering a maximum lag of one, the specification of the panel error-correction model is as follow:

$$\Delta MVA_{i,t} = \alpha_i + \delta_i \Delta IPM_{i,t} + \lambda_i (MVA_{i,t-1} - \hat{\beta}_i IPM_{i,t-1}) + \varepsilon_{i,t}$$

Where:

- $MVA_{i,t}$ is the market value added per share of insurance firm *i* in year *t*
- $IPM_{i,t}$ is the internal performance measure (per share or in percentage) of insurance firm *i* in year *t*
- $MVA_{i,t-1}$ is the market value added per share of insurance firm *i* in year *t-1*.
- $IPM_{i,t-1}$ is the internal performance measure (per share or in percentage) of insurance firm *i* in year *t-1*.
- λ_i: the speed of adjustment coefficient or the error-correction coefficient.

- α_i and δ_i are a constant and the short-run relationship coefficients, respectively.

- $\varepsilon_{i,t}$: white noise.

- i = 1, 2,….,N and t =1, 2,…,T denoting the sample parameter values, namely, insurance firm and time, respectively.

The PECM offers a very attractive statistical representation of the dynamics of the relationship between MVA and the selected internal performance measures, given that it allows for the distinction between the long-run and the short-run relationships. The short-run relationship (i.e., correlation) is β, while the feedback coefficient λ is the key of the long-run relationship. Indeed, the coefficient λ governs the error correction of the PECM. If λ is negative and significantly different from zero, then there is an error-correction, which implies that $MVA_{i,t}$ and $IPM_{i,t}$ will be cointegrated. Conversely, if λ is not negative and significantly different from zero, then the error-correction will be absent and there is no cointegration. In this study, we used the panel error-correction approach developed by Pesaran, Shin, and Smith (1999). It is noticeable that three different estimation techniques exist in the literature on the panel error-correction model, namely, the dynamic fixed-effects (DFE), the pooled mean group estimates (PMG) and the mean group estimates (MGE)[10]. We present only the results of the dynamic fixed-effects (DFE) technique, because the other two estimation techniques lead to similar results regarding the significance and the sign of the error-correction coefficient λ. Table 7 presents the results of our PECM estimation using the dynamic fixed-effects (DFE) technique. These results show that the short-run relationship between MVA and the selected internal performance measures differs from the long-run relationship. In fact, we observe that the different λ coefficients are statistically and significantly different from zero at the 1% level. Hence, these results support the existence of cointegration relationships for the different tested models, given that the λ coefficients are statistically and significantly negative and different from zero as well. This also means that our PECM estimation confirms the cointegration test results found in the previous section.

5.2 Comparative analysis of cointegration versus correlation results

In order to verify that a cointegration analysis might lead to different interpretations from those generated by a correlation analysis[11], we conducted a comparative analysis of the results based on both concepts. In this framework, the concept of correlation reflects the short-term relationship between MVA and the selected internal performance measures, while the concept of cointegration reflects the long-term relationship between MVA and these variables. First, we calculated Kendall's tau correlation coefficients (panel A: Table 8) and Spearman's rank correlation coefficients (Panel B: Table 8) between MVA and our five internal performance measures for pooled data. Secondly, we set a ranking in terms of the intensity of the short-run relationships (i.e., correlation) among the tested models. Finally, we used the rankings in terms of the intensity of the long-run relationships (i.e., cointegration) found in the previous section in order to compare the correlation results with the cointegration results. In interpreting the content of Table 9, let us focus on the case of the model (MVA-EPS). As we can see, this model shows the highest correlation coefficients (with both Kendall's tau and Spearman's rank), while the cointegration relationship between MVA and EPS is weak. In addition, we note that the model (MVA-ROE) shows the lowest correlation coefficients (with both Kendall's tau and Spearman's rank), while the cointegration relationship between MVA and ROE is strong.

Overall, these results indicate several cases of divergence between the two types of ranking. Thus, this clearly indicates that a correlation analysis can lead to results and interpretations totally different from those generated by a cointegration analysis. With this in mind, the correlation results should be interpreted with caution, given that a low (high) correlation does not necessarily imply a low (high) long-run dependence (Kat, 2003), while two cointegrated variables can display a correlation that is quite low at times (Alexander, Giblin and Weddington, 2001). In the short-term, cointegrated variables can temporarily diverge from their long-run equilibrium, due to several reasons (shocks, temporary market crisis, false signal, etc.). Hence, correlation results are very sensitive to the choice of the selected sample and study period. In our opinion, this explains the controversial results of the previous studies which examined the relationship between external and internal performance measures. Cointegration analysis leads to more robust results because it allows for the existence of a long-run dynamic equilibrium relationship between two variables while accepting their temporary divergence from this equilibrium relationship. This means that cointegration results are not quite sensitive to the choice of the study period, as long as it is relatively long.

6. CONCLUSION

This study investigates the relationship between internal and external performance measures by using the most recent econometric developments of non-stationary dynamic panel data, namely, the panel stationary tests [IPS (2003), LLC (2002), Breitung (2000), Hadri (2000) and the panel cointegration tests (Pedroni (2004) and Kao (1999)]. These tests are designed to overcome some important methodological and econometric shortcomings such as the limited data problem and the spurious regression problem both identified by Granger and Newbold (1974). The aim of this study was to explore the long-run dynamic equilibrium relationship between an insurance firm's market value added (MVA), as an external performance measure, and five selected internal performance measures, namely, earnings per share (EPS), free cash flow per share (FCF), economic value added per share (EVA), return on assets (ROA) and return on equity (ROE). Our empirical investigation was based on a sample of 24 U.S. insurance-related firms extracted from Stern & Stewart's database 2005 over the period 1991-2004.

The results show that the above five internal performance measures are statistically and significantly cointegrated with MVA. More specifically, the model (MVA-EVA) is the one that shows the most powerful cointegration relationship, compared to all other tested models. In itself, this result helps explain why these two measures should be useful in implementing a value-based management system in insurance firms, as stated in the following quote by Ronald Frank of Smith Barney: "I think that EVA and MVA bring a number of potential benefits to management and analysis of insurance companies. First, this approach systematically and consistently introduces the cost of capital into the analysis. This is especially relevant in the current operating environment, where capital management is perhaps the main discretionary value creation tool available to insurance companies. Second, and related to the first point, EVA and MVA provide a framework for analyzing the value implications of differing capital structures and acquisitions, which can then be weighed against such factors as rating consequences. Third, it provides a direct (if theoretical) link between economic performance and stock performance".[12]

In addition, our results indicate that the model (MVA-ROA) shows a more powerful cointegration relationship than the other three models: (MVA-ROE), (MVA-EPS) and (MVA-FCF). However, the cointegration relationship between MVA and ROE is statistically strong enough while the long-run dynamic relationships between

MVA and EPS as well as between MVA and FCF are rather statistically weak. On the whole, these additional results help us understand why investors and analysts are heavy users of an insurer's ROA and ROE as relevant internal performance measures of value creation. Indeed, the link between these two ratios and MVA has been shown to be statistically strong. This is a feature that seems to be particular to insurance firms.[13] Clearly, based on these results, one could make a convincing argument as to why MVA, EVA, ROA and ROE should be part of an insurer's KPIs.

To analyze the robustness of our results, we first estimated the panel error-correction model (PECM). The results of this estimation through the dynamic fixed-effects (DFE) technique are supportive of the cointegration tests. Second, we conducted a comparative analysis of the cointegration results versus the correlation results in order to verify whether both concepts might lead to different interpretations, given that a low (high) correlation does not necessarily imply a low (high) long-run dependence (Kat (2003)). The results clearly indicate the divergence between the two types of analyses which leads further support to the relevance of the cointegration approach.

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Notes

1. Levin and Lin (1993); Levin, Lin and Chu (2002); Maddala and Wu (1999); Im, Pesaran and Shin (2003) and Chang (2004).

2. Pedroni (1999, 2004); Kao (1999) and Bai and Ng (2004).

3. Financial firms are different from non-financial firms due to their specific characteristics (nature of products and business, structure of current assets and liabilities, etc.).

4. Only two tests among the seven tests proposed by Pedroni (2004) reject the null hypothesis of no cointegration between stock prices and dividends per share.

5. The seven tests proposed by Pedroni (2004) reject the null hypothesis of no cointegration between stock prices and dividends per share, at 1% significant level.

6. Market-based measures include total shareholder return (TSR), excess return, future growth value (FGV) and market value added (MVA).

7. To define NOPAT, GAAP net income would have to first be defined and then over 160 adjustments would have to be made. To define capital, GAAP assets and short-term debt would have to be defined, and then more than 160 adjustments would also have to be made.

8. This means that if a given internal performance measure is cointegrated with MVA, then one can predict with high precision the future value of the latter based on past data for the two variables.

9. One extension of this research would be to run this analysis on a larger sample of firms all operating in the same line of business (e.g, P&C insurance) instead of pooling different types of insurance-related firms in one single sample as we do here. Another possible extension would be to examine whether there is any effect on the results due the financial crisis in the period following 9/11. Implementing both extensions would reduce the number of observations available from our initial panel data. This could potentially make our statistical results less valid.

10. DFE assumes that both the long-run and the short-run coefficients are the same between cross-sectional units of the panel. MGE allows both to differ across units of the panel, while PMG takes a middle position in that it allows the short-run adjustment to differ across units, while assuming that the long-run relationship is similar across units of the panel.

11. In explaining the statistical meaning of cointegration when applied to two traded securities, Chan (2006) argues that, if cointegrated, then "the two price series cannot wander off in opposite directions for very long without coming back to a mean distance eventually. But it doesn't mean that on a daily basis the two prices have to move in synchrony at all."

12. http://sternstewart.com/?content=published&p=testimonial

13. In a similar study done on a sample of 520 US non-financial corporations over the period 1990-2004, Mouelhi (2009) found that only EVA shows a statistically strong cointegration relationship with MVA.

TABLE 1
DESCRIPTIVE STATISTICS (YEAR PER YEAR)

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
MVA	Mean	146.14	256.78	337.18	565.23	854.15	762.13	1794.0	1434.9	809.50	1047.3	1396.2	914.16	1792.9	1309.6
	Median	3.5808	7.7489	3.8170	7.3627	6.6793	7.4358	18.020	12.758	9.8366	12.102	14.650	6.3582	17.655	13.310
	S-D	700.19	1216.9	1634.2	2742.4	4152.7	3688.5	8689.1	6967.6	3918.9	5054.7	6745.5	4442.7	8706.1	6352.5
EPS	Mean	17.131	15.845	25.783	18.743	26.994	86.177	66.594	79.927	44.387	93.140	22.828	118.09	223.28	201.24
	Median	1.0900	0.8970	1.2360	1.0915	1.4626	1.7155	1.7553	1.9715	1.7507	2.3592	1.6651	1.6500	2.8981	3.4337
	S-D	78.121	72.140	118.93	85.488	123.63	411.89	314.05	379.81	208.59	444.68	105.99	569.58	1082.0	968.57
FCF	Mean	27.853	37.767	27.676	34.801	41.627	44.689	80.875	19.810	61.495	82.297	182.71	309.10	230.40	174.87
	Median	1.6153	1.5592	1.7589	1.3180	1.6862	1.9052	2.2011	2.3579	2.3362	1.0983	2.8028	4.7252	6.2612	5.7952
	S-D	125.89	176.81	125.41	160.59	192.35	208..32	385.92	87.943	295.01	393.83	877.48	1488.7	1095.1	821.41
EVA	Mean	-6.9495	-14.142	-1.2238	-15.459	-22.244	21.777	-19.593	-19.944	-85.075	-30.550	-113.37	-22.712	59.902	14.617
	Median	0.1422	0.2619	0.3448	0.1202	0.4131	0.4481	0.5262	0.7176	0.2936	0.4956	0.2317	0.3834	0.9315	1.1934
	S-D	34.506	68.949	8.3302	75.927	111.40	104.02	99.349	101.70	417.57	151.76	551.76	109.88	292.86	65.956
ROE	Mean	14.725	14.200	15.640	14.188	14.275	15.566	14.238	14.121	10.744	12.184	8.8813	10.533	11.595	13.114
	Median	14.045	14.922	15.127	12.717	12.718	14.170	13.723	13.096	10.830	12.358	11.027	9.8635	12.969	12.185
	S-D	7.5336	9.1378	7.1261	8.9831	7.2894	6.2764	7.0913	7.7786	7.9266	6.8380	12.161	7.2007	10.713	7.1637
ROA	Mean	3.9886	3.9771	4.2871	3.4871	3.7092	4.1729	4.0407	4.1095	2.9460	3.2344	2.6070	2.9408	3.4902	3.3890
	Median	3.1275	3.4790	3.5075	3.0650	3.0140	3.3315	3.1165	2.3540	2.6640	2.5495	1.5990	2.4070	2.9415	2.6385
	S-D	3.1393	3.0716	3.1080	2.7647	2.7651	2.8348	2.9212	3.2661	2.7754	2.8229	3.3609	2.9059	3.6141	2.7695

MVA is the market value added per share, EPS is the earning per share, FCF is the free cash-flow per share, EVA is the economic value added per share, ROE is the return on equity and ROA is the return on asset. N = 24.

TABLE 2
DESCRIPTIVE STATISTICS (POOLED DATA)

	Mean	Median	S-D
MVA	958.61	8.1491	5195.9
EPS	74.298	1.6215	469.28
FCF	96.856	2.3277	616.70
EVA	-18.212	0.3950	216.56
ROE	13.143	12.759	8.3156
ROA	3.5985	2.9305	3.0034

MVA is the market value added per share, EPS is the earning per share, FCF is the free cash-flow per share, EVA is the economic value added per share, ROE is the return on equity and ROA is the return on asset. N = 24 and T = 14.

TABLE 3
PANEL UNIT-ROOT TESTS: LEVELS

Variables	Breitung (2000)	Hadri (2000)	LLC (2002)	IPS (2003)
MVA	-0.344 (0.365)	13.139*** (0.000)	-1.093 (0.137)	-0.217 (0.413)
EPS	4.735 (1.000)	8.022*** (0.000)	1.333 (0.908)	3.176 (0.999)
FCF	5.163 (1.000)	8.587*** (0.000)	1.125 (0.869)	4.517 (1.000)
EVA	3.681 (0.999)	7.233*** (0.000)	-0.596 (0.275)	1.407 (0.920)
ROE	0.375 (0.646)	3.696*** (0.000)	3.133 (0.999)	-0.990 (0.160)
ROA	0.768 (0.885)	8.651*** (0.000)	3.651 (0.999)	-0.072 (0.470)

MVA is the market value added per share, EPS is the earning per share, FCF is the free cash-flow per share, EVA is the economic value added per share, ROE is the return on equity and ROA is the return on asset. (***), (**), (*) statistically significant at 1%, 5%, and 10%, respectively. Numbers in parentheses represent p-values. N = 24 and T = 14.

TABLE 4
PANEL UNIT-ROOT TESTS: FIRST DIFFERENCES

Variables	Breitung (2000)	Hadri (2000)	LLC (2002)	IPS (2003)
MVA	-10.098*** (0.000)	-1.881 (0.970)	18.978*** (0.000)	-14.081*** (0.000)
EPS	-3.561*** (0.000)	-2.606 (0.995)	-13.601*** (0.000)	-7.711*** (0.000)
FCF	-2.750*** (0.003)	-1.430 (0.923)	-10.234*** (0.000)	-5.947*** (0.003)
EVA	-2.842*** (0.000)	0.691 (0.244)	-15.710*** (0.000)	-9.408*** (0.000)
ROE	-3.591*** (0.000)	0.030 (0.487)	-9.491*** (0.000)	-10.699*** (0.000)
ROA	-3.863*** (0.000)	-1.591 (0.944)	-7.907*** (0.000)	-9.243*** (0.000)

MVA is the market value added per share, EPS is the earning per share, FCF is the free cash-flow per share, EVA is the economic value added per share, ROE is the return on equity and ROA is the return on asset. (***), (**), (*) statistically significant at 1%, 5%, and 10%, respectively. Numbers in parentheses represent p-values. N = 24 and T = 14.

TABLE 5
PANEL COINTEGRATION TEST: PEDRONI (2004)

Tests	MVA-EPS	MVA-FCF	MVA-EVA	MVA-ROE	MVA-ROA
Panel v-statistic	-1.184 (0.197)	-2.000* (0.054)	-2.842*** (0.007)	-1.923* (0.062)	-2.463** (0.019)
Panel rho-statistic	-2.342** (0.025)	-3.855*** (0.000)	-2.181** (0.037)	-1.172 (0.200)	-2.237** (0.032)
Panel PP-statistic	-5.645*** (0.000)	-7.723*** (0.000)	-5.883*** (0.000)	-4.128*** (0.000)	-6.883*** (0.000)
Panel ADF-statistic	-6.310*** (0.000)	-7.371*** (0.000)	-6.540*** (0.000)	-5.256*** (0.000)	-7.064*** (0.000)
Group rho-statistic	-0.421 (0.365)	-0.051 (0.398)	-0.106 (0.396)	1.211 (0.191)	0.975 (0.247)
Group PP-statistic	-7.976*** (0.000)	-5.794*** (0.000)	-7.032*** (0.000)	-4.943*** (0.000)	-4.882*** (0.000)
Group ADF-statistic	-6.348*** (0.000)	-5.595*** (0.000)	-5.570*** (0.000)	-3.993*** (0.000)	-4.677*** (0.000)

MVA is the market value added per share, EPS is the earning per share, FCF is the free cash-flow per share, EVA is the economic value added per share, ROE is the return on equity and ROA is the return on asset. The null hypothesis is no cointegration. (***), (**), (*) statistically significant at 1%, 5%, and 10%, respectively. Numbers in parentheses represent p-values. N = 24 and T = 14.

TABLE 6
PANEL COINTEGRATION TEST: KAO (1999)

β (p-value)	-0.632 (0.263)	0.467 (0.319)	1.769** (0.036)	1.82** (0.034)	1.823** (0.034)

MVA is the market value added per share, EPS is the earning per share, FCF is the free cash-flow per share, EVA is the economic value added per share, ROE is the return on equity and ROA is the return on asset. The null hypothesis is no cointegration. (***), (**), (*) statistically significant at 1%, 5%, and 10%, respectively. Numbers in parentheses represent p-values. N = 24 and T = 14.

TABLE 7
ESTIMATION RESULTS OF PANEL ERROR-CORRECTION MODELS: DYNAMIC FIXED-EFFECTS (DFE) TECHNIQUE

	Constant	$\hat{\delta}$	$\hat{\lambda}$	ajusted R^2	F-Test
ECM 1: $\Delta MVA_{i,t}=\alpha_i+\delta_i \Delta EPS_{i,t}+\lambda_i (MVA_{i,t-1}-\hat{\beta}_i\, EPS_{i,t-1})+\varepsilon_{i,t}$	179.72 (0.170)	2.095*** (0.000)	-0.215*** (0.000)	13.34	3.266*** (0.000)
ECM 2: $\Delta MVA_{i,t}=\alpha_i+\delta_i \Delta FCF_{i,t}+\lambda_i (MVA_{i,t-1}-\hat{\beta}_i\, FCF_{i,t-1})+\varepsilon_{i,t}$	174.58 (0.196)	-2.294 (0.552)	-0.119*** (0.000)	8.41	1.948** (0.021)
ECM 3: $\Delta MVA_{i,t}=\alpha_i+\delta_i \Delta EVA_{i,t}+\lambda_i (MVA_{i,t-1}-\hat{\beta}_i\, EVA_{i,t-1})+\varepsilon_{i,t}$	577.11*** (0.000)	1.784*** (0.002)	-0.487*** (0.000)	37.35	4.416*** (0.000)
ECM 4: $\Delta MVA_{i,t}=\alpha_i+\delta_i \Delta ROE_{i,t}+\lambda_i (MVA_{i,t-1}-\hat{\beta}_i\, ROE_{i,t-1})+\varepsilon_{i,t}$	530.68*** (0.000)	-3.450 (0.836)	-0.507*** (0.000)	35.27	4.036*** (0.000)
ECM 5: $\Delta MVA_{i,t}=\alpha_i+\delta_i \Delta ROA_{i,t}+\lambda_i (MVA_{i,t-1}-\hat{\beta}_i\, ROA_{i,t-1})+\varepsilon_{i,t}$	513.48*** (0.000)	-5.178 (0.433)	-0.507*** (0.000)	35.47	4.070*** (0.000)

MVA is the market value added per share, EPS is the earning per share, FCF is the free cash-flow per share, EVA is the economic value added per share, ROE is the return on equity and ROA is the return on asset. (***), (**), (*) statistically significant at 1%, 5%, and 10%, respectively. Numbers in parentheses represent p-values. N = 24 and T = 14.

TABLE 8
CORRELATION COEFFICIENTS (POOLED DATA)

Panel A: Kendall's tau Correlation coefficients					
	EPS	**FCF**	**EVA**	**ROE**	**ROA**
MVA	0.358*** (0.000)	0.249*** (0.000)	0.215*** (0.000)	0.111*** (0.001)	0.115*** (0.001)
Panel B: Spearman Correlation coefficients					
	EPS	**FCF**	**EVA**	**ROE**	**ROA**
MVA	0.471*** (0.000)	0.348*** (0.000)	0.268*** (0.000)	0.172*** (0.001)	0.175*** (0.001)

TABLE 9
CORRELATION VERSUS COINTEGRATION

	Correlation		**Cointegration**
Model	**Kendall's tau (rank)**	**Spearman (rank)**	**(statistical intensity)**
MVA-EPS	1	1	weak
MVA-FCF	2	2	weak
MVA-EVA	3	3	strong
MVA-ROE	5	5	strong
MVA-ROA	4	4	strong

MVA is the market value added per share, EPS is the earning per share, FCF is the free cash-flow per share, EVA is the economic value added per share, ROE is the return on equity and ROA is the return on asset. The second column represents the ranking in terms of the intensity of the short-run relationships (i.e., correlation) according to Kendall's tau correlation coefficients and the Spearman rank correlation coefficients. The third column represents the ranking in terms of the statistical intensity of the long-run dynamic equilibrium relationships (i.e., cointegration) according to both Pedroni and Kao tests. N = 24 and T = 14.