Does the Adoption of IFRS Influence Earnings Management towards Small Positive Profits? Evidence from Emerging Markets

Sawcen Chebaane and Hakim Ben Othman

Abstract—This paper investigates the effect of International Financial Reporting Standards (IFRS) adoption on the frequency of earnings management towards small positive profits. We focus on two emerging markets IFRS adopters: South Africa and Turkey.

We tested our logistic regression using appropriate panel-estimation techniques over a sample of 330 South African and 210 Turkish firm-year observations over the period 2002-2008. Our results document that mandatory adoption of IFRS is not associated with a reduction in earnings management towards small positive profits in emerging markets. These results contradict most of the previous findings of the studies conducted in developed countries. Based on the legal system factor, we compare the intensity of earnings management between a code law country (Turkey) and a common law country (South Africa) over the pre and post-adoption periods. Our findings show that the frequency of such earnings management practice increases significantly for the code law country.

Keywords—Civil law, common law, emerging markets, mandatory IFRS adoption, small positive profits.

I. INTRODUCTION

THE Globalization of economies, the transnationalization of companies and the openness of the markets of capitals, increased the need for information of a high quality which is required to be comparable among companies, ignoring any cultural or economic boundary. For that purpose, the International Accounting Standards Committee (IASC) was established since 1973 and came up with 41 International Accounting standards (IAS) in order to harmonize national accounting systems. In 2001, the IASC was replaced by the International Accounting Standards Board (IASB) as the international accounting standard setting body. The objective of the IASB is to develop a single set of high quality, understandable, enforceable and globally accepted financial reporting standards based upon clearly articulated principles.

Currently, more than 115 countries required or allowed the adoption of IFRS, or have established a calendar for the adoption of IFRS. All member states of the European Union were required to use IFRS since 2005 for listed companies. It was the same for South Africa, Turkey. More recently, Canada (since 2011) and Mexico (since 2012) were engaged in the same vein. Indonesia is following these countries.

The convergence process is ongoing in Indonesia. A decision about a target date for full compliance with IFRSs was made in 2012.

References [1], [16] and [19] investigated the influence of IFRS adoption on earnings quality. Other studies focused on earnings management (e.g. [6], [12]). Findings of these studies were mitigated. Some researchers consider that IFRS adoption is relevant to the country and can reduce the scope of earnings management and, therefore, improve the quality of earnings (e.g. [1], [8], [9], [16]). Some others made the proof of the opposite (e.g. [4], [5], [12], [27]).

Most studies in this area concentrated on developed countries, especially on the European Union (e.g. [24], [25]). However, little attention has focused on the effect of IFRS adoption on earnings quality or earnings management in emerging markets. The existing studies concentrated on the developing and emerging countries and are mostly either qualitative, based on analyzing primary resources (e.g. [21]-[23], [28]) or perception studies ([7], [26]).

Our study aims to determine whether mandatory adoption of IFRS in emerging markets reduces the frequency of earnings management towards small positive profits. The implementation of IFRS is required for listed South African (SA firms hereafter) and Turkish firms since 2005. The periods under analysis are: the pre-adoption period, i.e. from 2002 to 2004 and the post-adoption period, i.e. from 2006 to 2008.

The empirical investigation concentrates on the examination of the frequency of earnings management towards small positive profits for 55 South African and 35 Turkish firms, in the two periods. Based on the legal system factor, we compare between the frequency of earnings management towards small positive earnings in the code law country and the common law country which are respectively, Turkey and South Africa. Then, we focus our analysis on the post-adoption period.
The study shows that mandatory IFRS adoption does not reduce the level of earnings management in emerging markets. Nevertheless, findings highlight that the frequency of earnings management towards small positive profits increases significantly in the code law country. Contrariwise, it decreases insignificantly in the common law country. Results show that the frequency of earnings management towards small positive profits is less frequent for the common law country than for the code law country.

This study is based on earnings management which is a field of earnings quality in emerging countries, after the adoption of IFRS in emerging countries, would fill the existing gap in the literature.

South Africa is a common law country with relatively strong investor protection mechanisms in place. However, Turkey is a code law country with relatively weak mechanisms of investor protection. Hence, it will be interesting to compare the effect of IFRS adoption on earnings management towards small positive profits between two different contexts. Findings would be useful for the international accounting standards setters. It would help such setter to enhance the quality of accounting standards by taking into consideration the level of development of country or its legal system specificities.

The remainder of the paper is organized as follows. Section II discusses the literature review and hypotheses development, Section III exposes the data and methodology, Section IV presents the findings, Section V contains the conclusion and Section VI presents tables.

II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

A. Earnings Management and IFRS Adoption

Earnings management, in general, is defined by [11] as follow: “Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers”.

In our study, we focus on one aspect of earnings management which is earnings management towards small positive earnings. This research area of earnings management was established by [3] and followed by [10]. According to [10], managers practice earnings management to exceed thresholds like profits or specific values reflecting the firm’s performance in order to meet the analysts’ predictions.

For the reference [3] earnings can be manipulated by the managers in order to avoid earnings decreases and losses. For that purpose, managers disclose small increases and small positive profits instead of losses.

For many researchers, the adoption of IFRS would tend to reduce earnings managements and managerial discretions. Consistent with this vein [1] examined the accounting quality of firms in 21 countries that adopted IAS between the year 1994 and 2003. The study compares several accounting quality metrics for firms that apply IAS to those for a matched sample of firms that do not. The results of the study show that companies applying IAS exhibit higher accounting quality in terms of less income smoothing, less management of earnings towards a target, more timely recognition of losses, and higher association of accounting information with share prices and returns. In addition, those firms also display an improvement in accounting quality between the pre and post IAS adoption periods.

Reference [6] analyzed a sample of 1,722 European firms during their mandatory transition from local GAAP to IFRS in 2004 and 2005, to examine the impact of a change in accounting standards on the quality of firms’ financial statements. One of many results is that transition earnings management is present in all countries, but its level is higher in countries with relatively weak legal institutions and high levels of pre-transition earnings management. These results are consistent with managers using the transition to improve their reported earnings. IFRS earnings reconciliation disclosures are value relevant even with the noted transition earnings management.

Using the United Kingdom case, [16] concentrated on the switch from UK GAAP to IFRS during the period of 2004 - 2006. By examining companies accounting measures, he found that the implementation of IFRS in 2005 reduces the scope of earnings management.

The paper of [5] examines whether mandatory adoption of international accounting standards, IAS/IFRS, by French companies is associated with lower earnings management. Based on a sample of 353 French listed groups relating to the period 2003–2006, our results show that the mandatory adoption of IAS/IFRS in France has decreased earnings management level for companies with good corporate governance and those that depend on foreign financial markets.

On the other hand, some other studies consider that IFRS adoption tends to increase the scope of earnings management. Reference [4] examined whether the adoption of IFRS in the European Union has increased or decreased the scope for discretionary accounting practices by comparing discretionary accruals in the periods preceding and immediately after the regulatory change. They considered a sample of non-financial firms listed on 11 EU stock markets. The results obtained show that earnings management has intensified since the adoption of IFRS in Europe, as discretionary accruals have increased in the period following implementation.

As observed earlier, results related to the effect of mandatory adoption of IFRS on earnings management are mitigated.

Prior works (11, [3], [10], [18]) used the frequency of small positive net income as a measure to provide evidence of managing toward small positive earnings.

Thus, we predict in our study that firms of emerging markets applying IFRS report small positive profits less
frequently in the post-adoption period than in the pre-adoption period.

H1. Mandatory IFRS adoption is likely to reduce the scope for earnings management toward small positive profits in emerging markets.

B. Code Law versus Common Law Countries and IFRS Adoption

Countries can be classified into two groups by referring to their legal system: code law countries and common-law countries.

In 1998, [13] focused their investigation on legal rules covering protection of corporate shareholders and creditors, the origin of these rules, and the quality of their enforcement in 49 countries. Results have shown that common law countries generally have the best legal protection of investors, and French civil law (code law) countries have the worst, with German and Scandinavian civil law countries located in the middle. They also found that the concentration of ownership of shares in the large public companies is negatively related to investor protection. Thus, small, diversified shareholders are unlikely to be important in countries that fail to protect their rights.

With respect to earnings management, [18] examined systematic differences in earnings management across 31 countries. They argue these differences by referring to the concept that insiders attempt to protect their private control benefits using earnings management to conceal firm performance from outsiders. They found that, earnings management decreases when there is a strong protection of investors because strong protection limits insiders’ ability to acquire private control benefits, which reduces their incentives to mask firm performance.

Reference [2] concentrated their research on the incentives of earnings management in two different countries Canada (common law) and France (Code law). They found that these incentives are different for the two countries. They explained this result by the fact that the firms are affected by specific socio-economic features of the countries like the legal system.

More recently, [12] analyzed the effect of the mandatory introduction of IFRS standards on earnings quality, and more precisely on earnings management. They concentrated their study on three IFRS first-time adopter countries: Australia, France, and the United Kingdom. They found that the pervasiveness of earnings management did not decline after the introduction of IFRS. More than that, it increased in France. According to them sharing rules is not a sufficient condition to create a common business language, and that management incentives and national institutional factors play an important role in defining financial reporting characteristics.

To summarize, unlike the common law countries, in code law countries the stock market is not very active. The accounting information is made towards the stakeholders needs (like Banks and government). As a consequence, there is a less public disclosure and, then, an appropriate area for managers to manipulate earnings.

Based on the two different legal systems, we set the following hypotheses:

H2. The level of earning management towards small positive profits is higher in code-law countries than common-law countries before and after IFRS adoption.

H3. Firms from code law countries manage earnings towards small positive profits more frequently than firms from common-law countries in post-adoption period.

III. DATA AND METHODOLOGY

A. Sample

In this study, the population refers to firms listed in the Johannesburg Stock Exchange and to firms listed in Istanbul stock exchange between 2002 and 2008.

The sample consists of 55 South African listed firms and of 35 Turkish listed firms. This study has excluded banks as their accounting measures are not comparable with those of industrial and commercial firms.

2005 is the year of IFRS mandatory adoption in South Africa and Turkey. This year was excluded from the studied period. The period from 2002 to 2004 is considered as pre-adoption period. The period from 2006 to 2008 is considered as post-adoption period. Accounting and financial data were collected from Thomson Reuters database 2012.

The logistic regression is useful in analyzing categorical data, where the dependent variable is dichotomous and takes only two values, i.e. 0 and 1. For this reason, we used a logistic regression with panel data to test our hypothesis. All logistic regression results, in this study, have passed all tests judged as necessary.

B. Empirical Model and Variables

Following the studies of [1], [14]-[17], we test if firms manage accounting numbers in order to report small positive profits more frequently in the pre-adoption period than in the post-adoption period.

For that purpose, we compare, first, all firms considered as the entire sample (SA firms and Turkish firms) in the post-adoption and pre-adoption periods. We estimate the logit model below.

A negative coefficient on SPOS indicates that SA and Turkish firms, presenting emerging markets firms, manage earnings towards small positive amounts more frequently in the pre-adoption period than they do in the post-adoption period.

Secondly, we compare between the code law country (Turkish firms) and the common law country (SA firms) in the pre-adoption and the post-adoption period to know if the firms of the common law country manage earnings towards small positive profits less frequently than the firms of a code law country before and after IFRS adoption.

A negative coefficient on SPOS indicates that SA firms (or Turkish firms) manage earnings towards small positive
amounts more frequently in the pre-adoption period than they do in the post-adoption period. We regress the logit model for SA firms for the two periods and we, similarly, regress the logit model for the second group of Turkish firms.

Finally, we focused on the post-adoption period in order to analyze the behavior of the firms of the code law country versus the firms of the common law country, after the adoption of IFRS. For this reason we regress an indicator variable that equals 1 for SA firms and 0 for Turkish firms on SPOS and control variables.

A negative (positive) coefficient on SPOS indicates that Turkish firms (SA firms) manage earnings towards small positive amounts more(less) frequently than SA firms (Turkish firms) in the post-adoption period.

\[
IFRS(0,1)_it = \alpha_0 + \alpha_1 SPOS_{it} + \alpha_2 LEV_{it} + \alpha_3 TURN_{it} + \alpha_4 CF_{it} + \alpha_5 AUD_{it} + \epsilon_{it}.
\]

\[IFRS(0,1)\] is an indicator variable that equals one for observations in the post-adoption period (from 2006 to 2009) and zero otherwise(from 2001 to 2004).

SPOS is a dummy variable indicating a measure of small positive profits. SPOS equals one if net income scaled by total assets is between 0 and 0.01 and it equals 0 otherwise (see [1], [14], [16]).

LEV = end of year total liabilities divided by end of year equity book value;

TURN = sales divided by end of year total assets;

CF = annual net cash flow from operating activities divided by end of year total assets;

AUD = an indicator variable that equals one if the firm’s auditor is PwC, KPMG, Arthur Andersen, E&Y, or D&T, and zero otherwise.

IV. RESULTS

A. Comparison of Post and Pre-adoption Periods for the Entire Sample

Table I presents a comparison of the metric of earnings management towards small positive profits for firms of both emerging markets before and after they adopt IFRS. An earnings management test was used to examine whether firms from emerging markets manage earnings towards small positive profits more frequently in pre-adoption period rather than in post-adoption period.

Table II reveals that SPOS coefficient is positive, 0.691, but not statistically significant. This means that, for firms of emerging markets, the frequency of small positive profits increases after IFRS adoption, although this increase is insignificant. This result is inconsistent with our predictions.

As for control variables, we find that LEV coefficient is -0.128. This means that liabilities of firms of emerging markets decrease after IFRS adoption. This decrease is significant. However, the coefficients of TURN and AUD are positive and significant. In other words, sales increase more frequently in the post-adoption period for the firms of emerging markets. Being audited by the Big4 is a more frequent situation in post-adoption period than in pre IFRS adoption.

B. Comparison of the Level of Earnings Management between Code Law and Common Law Countries in Pre and Post-Adoption Periods

In order to control the effect of legal system on earnings management toward small positive profits, we compared between the frequency of earnings management of firms of a code law country (Turkey) and the frequency of earnings management of firms of a common law country (South Africa), before and after IFRS adoption. Results of this test are presented in the Table III.

For the code law country, the SPOS coefficient is positively significant, 2.105. As indicated earlier, the frequency of earnings management toward small positive profits increases significantly after IFRS adoption for firms of the code law country.

Conversely, the coefficient of the SPOS is negative but insignificant for SA firms, which involves that the frequency of earnings management towards small positive profits decreases for the firms of the common law country, in the post-adoption period, but insignificantly.

These results can be considered, partially, as consistent with our predictions where we hypothesized that the level of earnings management towards small positive profits is higher for the firms from code law country than for firms from the common law country, before and after IFRS adoption.

Nevertheless, we infirm the fact that the level of earnings management towards small positive profits decreased for the firms of code law country before and after IFRS adoption, because the coefficient of SPOS was positive and significant.

Considered as control variables, LEV has a negative coefficient for the two groups of firms. This means that liabilities decrease more frequently in the post-adoption period for both the code law country and the common law country. However, it is significant for the former.

The coefficient of the control variable AUD has a positive sign for the both groups of firms. This situation can be interpreted as follow: being audited by Big4 is more frequent after IFRS adoption but this is only significant for Turkish firms (code law country).

As mentioned in Table III, the coefficient of the control variable TURN, as a measure of sales, is negative and significant for SA firms, but positive and significant for Turkish firms.

This means that sales decrease more frequently and significantly for SA firms in post-adoption period. Conversely, sales increase insignificantly, more frequently in post-adoption period for Turkish firms.
C. Comparison of the Level of Earnings Management between Code Law and Common Law Countries in Post-Adoption Period

Table IV presents findings for earnings management towards small positive profits for common law and code low countries in the post-adoption period.

It reveals that the coefficient on SPOS, -1.64888, is negative and significant. This result is consistent with our predictions. It suggests that the earnings management towards small positive profits is less frequent for the firms from the common law country (SA) than those from the code law country (Turkey), in the post-adoption period.

As shown in the Table IV, the coefficient of the control variable TURN is negative and significant, suggesting that sales decreases more frequently for the firms of the common law country than of the code law country, in the post-adoption period.

V. Conclusion

In this paper, we investigate whether the mandatory adoption of IFRS in two emerging markets had an impact on earnings management as a measure of earnings quality. We concentrate our investigation on two countries, South Africa and Turkey.

We select these two countries because they are classified as emerging markets, IFRS were required in these countries since 2005 and because they belong to two different legal systems. South Africa is a common law country known with its strong investor protection mechanisms. Turkey is, on the other hand, a code law country with weaker mechanisms of investor protection.

Our findings show that mandatory IFRS adoption in emerging markets does not reduce the scope of earnings management towards small positive profits in the pre and post-adoption periods. This finding was inconsistent with prior researches in developed countries ([1], [16], [29]).

Based on the legal system factor, the study shows that the frequency of earnings management towards small positive profits increases significantly in the code law country (Turkey). Contrariwise, it decreases insignificantly for the common law country (South Africa) between the pre and post-adoption periods of IFRS. Our findings also give an indication on the earnings management in the post-adoption period: the frequency of earnings management towards small positive profits is less frequent for the common law country than for the code law country. Such results are consistent with the idea that the scope earnings management decrease, after IFRS adoption, for common law countries more frequently than for code law countries. In other words, the good effect of IFRS can be seen obviously in the common law countries where legal system mechanisms are well-built [6], [12], [18].

The findings of this study are related to the case of Turkey and South Africa which are considered as emerging markets. Nevertheless, [20] and [7] warned from the danger of generalizing the judgment linked to the relevance of IFRS to developing countries, because such countries are considered as a heterogeneous group. Therefore findings cannot be generalized to other developing countries. Another limitation of the study is that the empirical investigation is based on only one feature of earnings management which is earnings management towards small positive profits. It would be interesting if we build a construct of several aspects of earnings management.

APPENDIX

TABLE I
DESCRIPTIVE STATISTICS RELATED TO VARIABLES USED IN THE ANALYSIS: ENTIRE SAMPLE

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pre-adoption of IFRS</th>
<th>Post-adoption of IFRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPOS</td>
<td>Mean: 0.030 Std. Dev: 0.170</td>
<td>Observations: 270</td>
</tr>
<tr>
<td>TURN</td>
<td>Mean: 7.354 Std. Dev: 34.32</td>
<td>Observations: 270</td>
</tr>
<tr>
<td>CF</td>
<td>Mean: 0.066 Std. Dev: 0.211</td>
<td>Observations: 270</td>
</tr>
<tr>
<td>AUD</td>
<td>Mean: 0.604 Std. Dev: 0.491</td>
<td>Observations: 270</td>
</tr>
</tbody>
</table>
TABLE II

<table>
<thead>
<tr>
<th>Test variables</th>
<th>Estimated coefficients (significance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPOS [prediction (-)]</td>
<td>0.691 (0.195)</td>
</tr>
<tr>
<td>Control variables</td>
<td>LEV</td>
</tr>
<tr>
<td></td>
<td>TURN</td>
</tr>
<tr>
<td></td>
<td>CF</td>
</tr>
<tr>
<td></td>
<td>AUD</td>
</tr>
<tr>
<td>Model evaluation</td>
<td>LR ch2 (significance)</td>
</tr>
</tbody>
</table>

(*)**, (**) and (***) indicate statistically significant factors at 10%, 5% and 1% levels respectively.

TABLE III

<table>
<thead>
<tr>
<th>Test variables</th>
<th>Estimated coefficients (significance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPOS [prediction (-)]</td>
<td>2.105 (0.396)</td>
</tr>
<tr>
<td>Control variables</td>
<td>LEV</td>
</tr>
<tr>
<td></td>
<td>TURN</td>
</tr>
<tr>
<td></td>
<td>CF</td>
</tr>
<tr>
<td></td>
<td>AUD</td>
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<tr>
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</table>

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TABLE IV

<table>
<thead>
<tr>
<th>Test variables</th>
<th>Estimated coefficients (significance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPOS [prediction (-)]</td>
<td>-1.64888 (0.000***)</td>
</tr>
<tr>
<td>Control variables</td>
<td>LEV</td>
</tr>
<tr>
<td></td>
<td>TURN</td>
</tr>
<tr>
<td></td>
<td>CF</td>
</tr>
<tr>
<td></td>
<td>AUD</td>
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<tr>
<td>Model evaluation</td>
<td>LR ch2 (significance)</td>
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</tbody>
</table>

(*)**, (**) and (***) indicate statistically significant factors at 10%, 5% and 1% levels respectively.

TABLE V

<table>
<thead>
<tr>
<th>Test variables</th>
<th>Estimated coefficients (significance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPOS [prediction (-)]</td>
<td>.3368857 (0.0690)</td>
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<tr>
<td>Control variables</td>
<td>LEV</td>
</tr>
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<td></td>
<td>TURN</td>
</tr>
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<td></td>
<td>CF</td>
</tr>
<tr>
<td></td>
<td>AUD</td>
</tr>
<tr>
<td>const.</td>
<td>.1249827 (0.579)</td>
</tr>
<tr>
<td>Model evaluation</td>
<td>LR ch2 (significance)</td>
</tr>
</tbody>
</table>

(*)**, (**) and (***) indicate statistically significant factors at 10%, 5% and 1% levels respectively.

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REFERENCES


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