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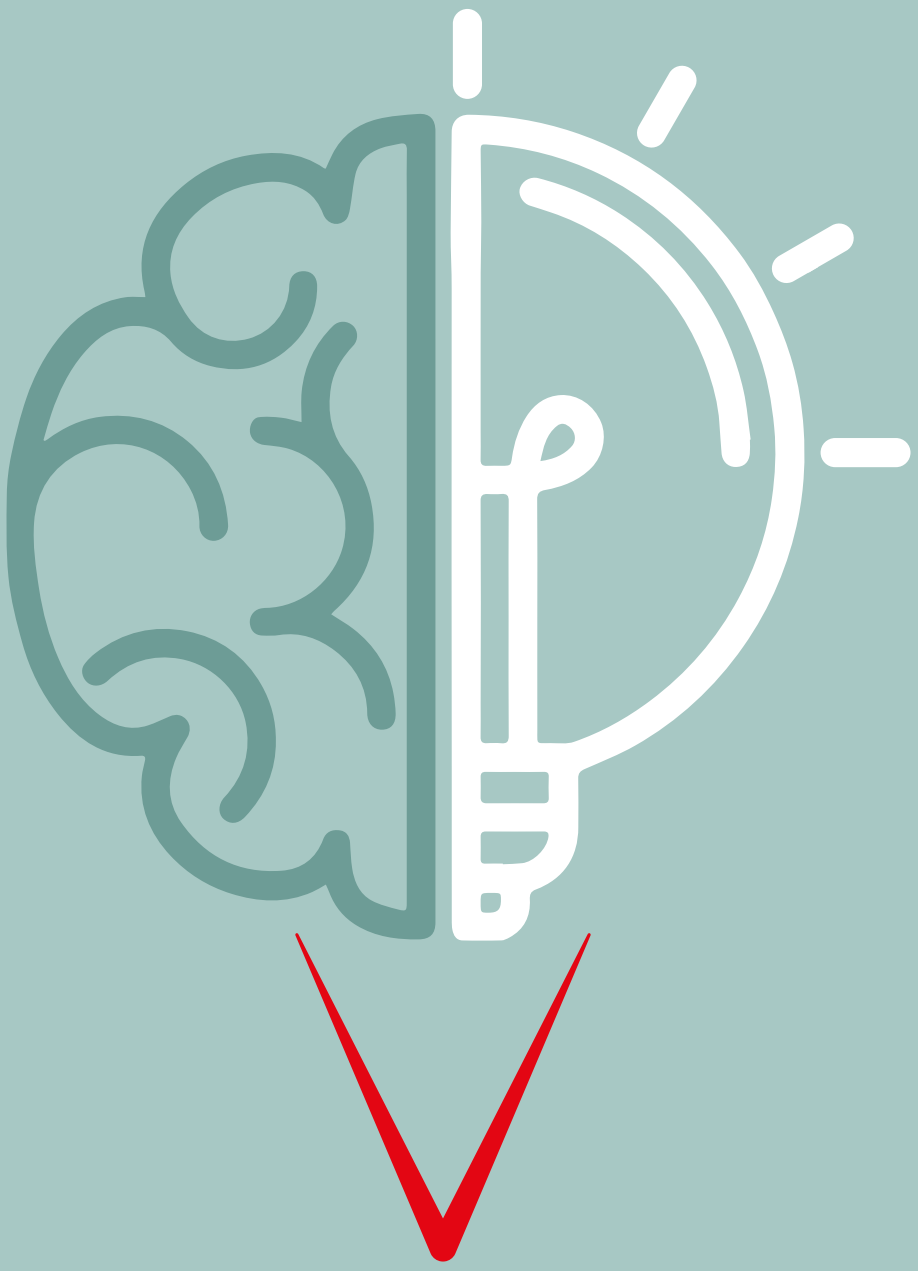

Economic impact and statistical significance:

INTERPRETING ACCOUNTING RESEARCH IN THE CONTEXT OF EVIDENCE-BASED POLICY-MAKING

STUART MCLEAY
ELISABETTA BARONE

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Executive summary

This briefing, funded by ICAEW's charitable trusts, is addressed to practitioners such as financial analysts, finance directors, audit partners, 'technical' departments in audit firms and all who are involved in standard-setting.

Many academic studies rely on statistical significance to draw conclusions from empirical analysis about the impact of policy issues, such as the adoption of IFRS or the change in the particular requirements of a Standard. This approach has received criticism because of a failure to focus on, or demonstrate, the economic significance of the change.

We set out to re-interpret the evidence base of published quantitative accounting research in terms of its economic significance. Results were collected from 40 published research studies, mostly amongst the 200 surveyed by Brian Singleton-Green in The Effects of Mandatory IFRS Adoption in the EU: A Review of Empirical Research, ICAEW (2015). We found that economic impact was discussed for a wide range of factors that might be influenced by regulatory change (eg, cost of capital, analyst following, earnings management, and many others). Generally, however, authors infer economic impact in terms of an expected change in the variable of interest, for the average firm. Amongst these studies, we did not find any extrapolations of economic impact that were quantified at the level of the economy or economic sector as a whole.

Unfortunately, when we attempted to estimate the economic impact on the corporate sector on the basis of published research, we met several barriers that prevented us from doing so to our satisfaction. Most of the obstacles were technical in nature, relating to statistical method and the conventions of journal paper publication. We describe these within this briefing. It is important to note, nevertheless, that each of the papers surveyed was fully transparent in the justification of its statistically significant results.

To the practitioner, the conclusion - that we experienced difficulty in quantifying the full extent of economic impact - may seem surprising, given that the large samples commonly used by researchers account for much corporate economic activity. For policy-makers, and accounting researchers with an interest in the political and economic implications of regulation and standardization, who may wish to model the kind of 'effects analysis' considered by EFRAG, IASB and FASB, a useful set of research questions emerges from our own attempts to unravel the connections between statistically significant results and their economic impact. These are summarised in the concluding section.

1. Introduction

The aim of this report is to investigate the extent to which regulators and standard-setters can determine the economic significance of the impact of policy change from the evidence presented in academic studies of accounting and financial reporting. Surprisingly, we were unable to infer the full scale of economic impact in most of the studies reviewed, which we selected from the large volume of work on the impact of the IFRS mandate. A well-received report, The Effects of Mandatory IFRS Adoption in the EU: A Review of Empirical Research, written by Brian Singleton-Green and published by the ICAEW in 2015, provided a comprehensive overview. Most, but not all, of the surveyed studies concluded, with caveats, that IFRS adoption has been beneficial regarding both the properties of financial reporting and the consequences for firms and markets. Great reliance is placed in these published studies on the statistical significance of the variables that are believed to account for the observable outcomes of IFRS reporting. However, little is known about the quantifiable economic impact overall. As mentioned, we found it difficult to draw such inferences ourselves from the published results. In other disciplines, where economic impact studies are well established, it is commonplace to estimate the impact on output aggregates such as GDP, but such an approach is not usual in policy-based accounting research. In this briefing, which is exploratory, we consider some of the problems that can arise when attempting to draw inferences about the aggregate level of economic impact from published accounting research.

2. Evidence-based policy-making and standard-setting

2.1 IMPACT ANALYSIS AND ACCOUNTING RESEARCH

In general terms, accounting regulators and their agencies work to a remit of setting standards that will govern the corporate financial information essential to the efficient functioning of an economy. In accounting terms, this objective can be seen as the provision of 'credible, transparent, comparable, and unbiased' financial statements.[1] But preparing and auditing information to such standards is costly, and for that reason, standard-setting agencies are expected to issue new accounting rules and regulations only when the improvement in quality and the consequent economic impact justify the cost of preparation and dissemination.

Although the research studies that we consider here deal with a past event, the widespread adoption of IFRS, the issues raised in this briefing should be applicable to the impact analysis of any new standard, or accounting regulation. In this context, it is worth recalling that regulatory impact analysis is now the common currency amongst standard setters and other agencies involved in standard-setting. Following an exploratory analysis for IFRS 3 (see the IASB's 2008 publication, Business Combinations Phase 2: Project Summary, Feedback and Effect Analysis), the European Financial Reporting Advisory Group made suggestions in a 2012 position paper to further improve the way in which accounting standard setters could carry out their business. They emphasised that an 'effect analysis' should be integrated more formally into the standard-setting process so as to assess the extent to which regulatory change meets the intended outcomes. Here, again, the interest is not only in improving financial reporting, but also in understanding the impact on investors and reporting entities. Along similar lines, and in accordance with a recommendation made by the IASB Trustees in 2012, the methodology has been further developed for IFRS, and, in the meantime, some updated analyses of the likely impact of standards have been made available (eg, IFRS 10 – Consolidated Financial Statements, and IFRS 12 – Disclosure of Interests in Other Entities).

Given our focus in this briefing on academic research into the transition to IFRS, we should remember the standard setter's explicit claim that, by using IFRS, firms would upgrade to higher quality financial statements that should be more transparent and more comparable in informing the decisions made by users of financial reports, ie, equity investors, lenders and other stakeholders. Indeed, in the run up to the EU mandate, the Commission's IAS Regulation of 2002 set out its aims in similar terms, ie, 'This Regulation has as its objective the adoption and use of international accounting standards…in order to ensure a high degree of transparency and comparability of financial statements and hence an efficient functioning of the Community capital market and of the Internal Market'. Commissioner Charlie McCreevy volunteered the following, far-reaching, predictions: 'As users become more familiar and confident with IFRS, the cost of capital for companies using IFRS should fall. It should lead to more efficient capital allocation and greater cross-border investment, thereby promoting growth and employment in Europe.'

In the same vein, other regulatory authorities prefaced their own introduction to IFRS with similar expectations of specific economic impacts. Some examples are: to reduce the information costs of comparing Canadian firms' statements with the statements of foreign firms; to decrease the cost of capital for Australian businesses; to improve the ability of Brazilian firms to access international capital markets; and, in the case of South Africa, to develop and deepen the capital market.

[1] Note that the term 'transparency' appears in the Status and Purpose of the Conceptual Framework, but not in the Framework itself.

At the same time, it is important to recognise the assertions in some jurisdictions that certain aspects of IFRS may represent a step backwards from their local requirements. It is necessary therefore to assess the global costs and benefits, and whether these outweigh any short-term effects in the jurisdictions where local requirements are perceived as superior solutions. For example, with Insurance Contracts, the Australian Standards (and hence practice under IFRS 4) were developed after major failures in the industry, and some in Australia have seen IFRS 17 as a step backwards. However, the perceived increase in global comparability has led to the expectation that the overall trade-off is positive.

In 2014, the European Commission initiated a review of the various benefits of the IFRS mandate, and their associated costs. The broad question asked was whether the IAS Regulation that mandated IFRS reporting had helped to ensure a 'level playing field' between European companies and, more specifically, to what extent the EU's move to IFRS reporting has affected both access to capital (ie, listed debt and equity) and the overall cost of capital to companies. They also asked whether the use of IFRS protects investors in the Member States of the EU, contributes to the maintenance of confidence in financial markets, and improves the ability of companies to trade or expand internationally. Other criteria that potentially may feed into cost-benefit analysis, as explored by the Commission's expert group, included: (i) changes in the costs incurred by preparers (eg, administrative, compliance and other costs for additional staff, training, advisory services, external audit, additional expertise and IT development) compared with the cost that the company would have otherwise incurred to comply with alternative standards; (ii) the relative cost incurred by users in the analysis and benchmarking of companies; and (iii) the administrative and regulatory burden on public authorities regarding the ongoing application of IFRS.

In the research literature, some of the impact factors mentioned above were first considered in depth by Luzi Hail, Christian Leuz and Peter Wysocki in their reflection on the SEC's Roadmap surrounding the potential application of IFRS by US issuers (Accounting Horizons, 2010). Their analysis highlighted greater market liquidity, a lower cost of capital and a better allocation of capital as potential benefits. It also mentioned economic impact in the form of re-distributional effects across firms, trade flows, portfolio flows and foreign direct investments (including international mergers and acquisitions). Empirical research since then has focused on this wide range of economic factors, in addition to improvements in comparability.

It is interesting to contrast the approach that has developed in accounting with other areas where economic impact analysis is undertaken. Typically, the analysis will produce a range of estimates of the change in economic output attributable to a proposed policy. For example, a well-cited study of the economic impact of pandemic influenza in the United States (Meltzer, Cox and Fukuda, Emerging Infectious Diseases,1999) put this in dollar terms as follows: 'The estimated economic impact would be US $71.3 to $166.5 bn, excluding disruptions to commerce and society', adding that, 'at $21 per vaccinee, we project a net savings to society if persons in all age groups are vaccinated'. With this in mind, our aim in this study has been to ask how economic impact is reported in accounting research, and whether aggregates (at the level of an economic sector, or a national economy, or globally) can be inferred easily from the statistically significant results published in research journal papers, given the large scale corporate databases that are available.

2.2 EXAMPLES OF GOOD PRACTICE IN COMMUNICATING RESEARCH RESULTS

The first academic study of IFRS to quantify 'economic impact' was published by Holger Daske and colleagues in 2008. For Trading Costs, for example, the authors add (in logarithms) their regression coefficient estimate to the prior median, giving (in antilogarithms) a readily understandable estimate of the expected value after switching to IFRS, expressed in basis points, as follows:

> *We compute the level of the total trading costs after the switch to IFRS and the mandate as* $e^{ln(0.0423)-0.0299} = 0.0411$ *(or 411 basis points) for mandatory adopters...The coefficient estimate of −2.99…suggests that the total trading costs of mandatory IFRS adopters decrease by 12 basis points, which amounts to a 3% improvement relative to the pre-adoption median of 4.23% (or 423 basis points).*
>
> ***(Daske, Hail, Leuz and Verdi, Journal of Accounting Research, 2008, p1110)***

This is a clear example of the way in which accounting researchers can translate the technical language of regression analysis into an impact statement that is interpretable by practitioners, in this case, in terms of basis points.

Joanna Wu and Ivy Zhang provide a further illustration of the way accounting researchers convey their results informatively, in support of their argument that the greater the demand for more informative accounting earnings as a basis for performance evaluation in more widely held firms, then the greater has been the incentive to adopt internationally acceptable accounting standards. These authors draw inferences about the marginal effects when the percentage of closely held shares increases, in this case by one standard deviation. The response, a measure of the probability of adopting IFRS, is seen to fall as expected:

> *The marginal effect suggests that a one standard deviation increase in the percentage of closely held shares decreases the adoption likelihood by 1.26%, or 6% of unconditional adoption probability of 20.7% (200/966).*
>
> ***(Wu and Zhang, The Accounting Review, 2009, p1294)***

Their model is estimated on a binary variable equal to 1 for 200 voluntary adopters and 0 for 766 non-adopters; hence the unconditional probability of 20.7% (200/966). The weighted mean of closely held shares across the sample of 966 firms is 57% and its standard deviation is 25%. So, essentially, these authors are inferring that, if the proportion of closely held shares were to increase by 25%, from 57% to 82%, the probability of adopting IFRS would fall from 20.7% to 19.4%. In other words, a very substantial change in ownership seems to have been required in order to bring about only a small change in favour of adopting IFRS for the average firm.

This second example is included here as an illustration of the way in which accounting researchers try to communicate non-monetary impact. The example also draws attention to the dilemma discussed next in this briefing: whether the statistical significance of predictors is synonymous with the economic importance of the consequent variation in response.

3. Economic impact versus statistical significance

3.1 ARE STATISTICALLY SIGNIFICANT RESULTS LIKELY TO BE ECONOMICALLY IMPORTANT?

The reliance on statistical significance in drawing conclusions from empirical analysis has been subject to much debate. The arch-critics claim that the majority of research papers published in applied economics journals give far less attention to economic significance than to statistical significance. They also claim that the authors of such papers are likely to accept hypotheses based on coefficients with a t-ratio greater than a critical level even when displaying low economic effect. One of the main concerns is that, even when they are statistically significant, predictor variables that explain only a low proportion of the variability in the response variable are unlikely to be economically important.

The implications for accounting practitioners and policy-makers can be seen in Sudipta Basu's critique of the standard approach to statistical inference in accounting:

> *Empirical articles do not often discuss the meaning of a regression coefficient with respect to real-world decision variables and their outcomes. Thus, accounting research results rarely have practical implications, and this tendency is likely worst in fields with the strongest reliance on statistical significance such as financial reporting research.*
>
> ***(Basu, Accounting Horizons, 2012, p858)***

In other words, statistical testing is typically used to infer whether a particular financial reporting effect exists, rather than to measure the magnitude of the effect and to gauge its practical importance. Early empirical accounting researchers such as Ray Ball, Philip Brown and William Beaver went to great lengths to estimate how much extra information reached the stock market at the time of the earnings announcement, whereas, it is said, much contemporary accounting research limits itself to investigating which other factors may potentially moderate these effects.

The key issue here is to define economic relevance. The following guidance tries to set out in simple terms how we can demonstrate economic significance from regression analysis:

> *Often one can gauge the economic significance only through some detective work. Typically a 'summary statistics' table is the first table included in an applied study with means and standard deviations of the data used in the analysis. From this and the regression estimates tables, along with some approximate multiplication, the economic significance can be determined…It is fairly clear that 'reasonable ranges' of the effect in economically understandable terms are the most relevant numbers to report.*
>
> ***(Elliott and Granger, The Journal of Socio-Economics, 2004, p547)***

For the background study conducted for this briefing, we built our analysis around the predictor of the expected value, reconstructed for each of 40 research papers, where the contribution of each explanatory variable to the expected value is the product of its mean and regression estimate, as proposed above by Elliott and Granger. The economic relevance for the sample as a whole can be quantified by multiplying the effect for the average firm by the number of firms involved.

3.2 WHAT DO LEADING ACCOUNTING RESEARCHERS THINK?

The American Accounting Association's journal, Accounting Horizons, has published a number of provocative articles in recent years, in which leading researchers have voiced their candid opinions on the state of accounting research. Some of the points made by these 'devil's advocates' bear on the issue under discussion here.

Jerold Zimmerman contends that much of the empirically documented impact of external financial reporting on capital markets is small. This is reflected, he says, in studies of the capital market effects of IFRS adoption, which document a statistically significant effect, even though the economic magnitudes are low. Moreover, while the ability of the firm's financial statements to report on underlying economic uncertainty might well alter the market's assessment, it is not theoretically justified as a first order effect. Appealing to researchers to question the general assumption that managers are able to bring about a significant economic impact simply by improving accounting quality, Zimmerman offers the following advice:

> *Researchers should examine the economic magnitude of the documented effect on firm value, and ask if it is 'too big'. If one's prior is that the effect should be small (second order) and it is 'too large,' then the researcher should question the research design strategy and whether correlated omitted variables, endogeneity, sample selection bias, etc., are corrupting the study's inferences.*
>
> ***(Zimmerman, Accounting Horizons, 2013, p893)***

The magnitude of the economic effects implied by accounting research results is also questioned by Ray Ball, who disputes the widespread notion that earnings manipulation routinely occurs to the great extent that is broadly inferred from reported regression estimates. The excessive amount of the estimated malpractice is treated with great scepticism by Ball, who points to a thought-provoking complication:

> *The enormous dollar magnitudes of allegedly 'discretionary' accruals are disguised in the literature by expressing them as a proportion of total assets, but they are enormous nevertheless.*
>
> ***(Ball, Accounting Horizons, 2013, p850)***

While these arguments are presented mainly within the context of the average firm, the mention of 'economic significance' and 'economic magnitude' has clear implications for the economy as a whole, or the universe of firms. Further support for the main point that we put forward in this briefing is given by Thomas Dyckman and Stephen Zeff, who refer to 'economic importance' in maintaining that:

> A statistically significant result is not necessarily an important result. Without establishing the economic importance of the result, which requires additional work on the part of the researcher, the mathematics reported to date is worthless.
>
> ***(Dyckman and Zeff, Accounting Horizons, 2014, p703)***

There is clearly a pressing requirement to develop robust approaches that will, as we suggest in this briefing, translate the results of statistical estimation in policy-related research into quantified effects not just for the average firm, but also, by extrapolation, for the local or global economy, or at least for a sample that is able to represent the sector under investigation or the economy as a whole.

4. Extrapolating from published research results

4.1 THE RESEARCH REPORTS THAT WE EXAMINED

The remainder of this briefing concerns the 40 selected journal articles for which we have reworked the statistical results. A full list of the response variables considered in these studies is given in the Appendix at the end of this briefing. Using a standardised framework, and building on the authors' discussions of their own results, we have tried to draw inferences about economic impact directly from the regression coefficients and descriptive statistics reported in each of the published papers involved.

Technically, each such regression coefficient summarises the rate of change in the conditional mean of the response variable, telling us how much the expected value is likely to increase or decrease when the explanatory variable involved changes by one unit, holding all the other explanatory variables constant. Relying on this basic feature of regression analysis, we have made a first attempt at re-examining total impact in the context of the full predictor implied by each set of published regression results, taking into account the additional information provided by authors regarding the mean values of explanatory variables and response variables across their sampled firms.

Overall, in most of the studies reviewed, we were unable to determine the full economic significance of results. Below, we explain the reasons for this outcome and offer suggestions on what can be done about it.

4.2 TECHNICAL CONSIDERATIONS

Consider the following simple example, where, for four firms only, we show the expectations from a linear regression between Earnings and Sales, where Earnings = a + b Sales, with regression constant a = 20.3 and regression slope b = 0.1742, and where the prediction errors will sum to zero.

TABLE 1 - Extrapolating economic aggregates from research results: a simple example

in $ millions	Earnings	Sales	Earnings Expectation = a + b Sales	Prediction Error
Firm 1	995.5	6,512.6	1,154.9	-159.4
Firm 2	1,175.3	8,758.1	1,546.0	-370.7
Firm 3	3,468.4	14,419.3	2,532.2	936.2
Firm 4	3,566.4	22,688.0	3,972.5	-406.1
Average	**2,301.4**	**13,094.5**	**2,301.4**	
Sum	**9,205.6**	**52,378.0**	**9,205.6**	**0.0**

It is evident, as demonstrated here, that Average Earnings = a + b Average Sales = $20.3m + 0.1742 x $13,094.5m = $2,301.4m. Hence, for the four firms taken together, the combined Earnings for this sample is $2,301.4m x 4 = $9,205.6m. A similar extrapolation can be made from Average Sales to estimate total output of $52,378.0m. It follows that, with adequate disclosure of the number of observations, the variable means, and the appropriate regression

coefficients, it should be feasible to reconstruct the economic aggregates that would be useful in policy analysis. For instance, in this case, a simple extrapolation could suggest that a 1% increase in Sales would generate additional Earnings in the economic sector of $91.2m.[2]

More generally, as the interpretation of economic impact might be informed by drawing inferences for the average firm in this way, then changes attributable to a regulatory event such as IFRS adoption may be assessed by examining the marginal contribution of the explanatory variables. In the same spirit as shown above, when summed across the firms involved, this provides a basis for estimating the potential change for the sample as a whole, and the economy it represents.

However, the above requires (i) that descriptive statistics are reported with due precision for all variables used in fitting predictive models, including transformed variables and indicator dummies, and (ii) that all model components are reported in full, including constants and interaction terms. This is rarely straightforward. When the reported descriptive statistics have been obtained from a set of observations that differs from the fitted sample, the expected value that is reconstructed may not be equal, as it should be, to the mean of the response variable. The discrepancy between the observations and the sample occurs when the reported statistics describe the sample before the deletion of any outliers; or before removing firm-year panels with incomplete observations (all of which may be dropped from the regression); or when the regression model is fitted for other reasons to a subset taken from the full sample.

A further complication concerns the fitting of fixed effects by firm, year, industry and country. These effects are often under-reported. Additionally, an estimating model may have been employed that expands one or more of the categorical variables into a set of 0,1 indicators, with the reported constant being attributable only to the benchmark group. Technically, this arises when the model is fitted with a corner-point constraint on the first group, or the most prevalent group, rather than being fitted with a weighted constant under a panel design in which the fixed effects will sum to zero.

Other assumptions that we had to make concern unreported indicator variable proportions (in some circumstances, we could infer the proportion from the reported count data for subsamples), unreported means of interacted variables (we used the product of means), and transformations such as the logarithmic. If the descriptive statistics only reported on the raw data, we employed the log of the adjusted median rather than the log of the mean.

We found that, in most cases, the inferences drawn could be treated only as indicative. A pervasive obstacle is that fixed or random effects make a substantial contribution to much of the modelling, but are often unreported because they are voluminous; yet they are particularly relevant to our understanding of the economic impact through time and across firms operating in different sectors and based in numerous jurisdictions.

[2] The simple example is only illustrative. A more robust estimation of total output and income for an economic sector, using a value added approach, would offset intermediate flows such as interfirm sales and interfirm dividend transfers.

4.3 TWO ILLUSTRATIVE CALCULATIONS

Table 2 provides the first of two illustrations of the translation of statistical estimations into economic quantities. This first example is based on the cost of capital effects reported by Holger Daske and his coauthors in their explanation of the heterogeneity in economic consequences around IAS/IFRS adoptions. The mean of Total Assets, one of the predictors, is reported as $1,273.50m. For a sample size N = 105,527 for the period 2001-2005, assets in the observed economy sum to $26,878bn in the average year, partitioned across the sample as in Column (4) in Table 2. The average cost of capital is reported by the authors as 10.2%, and the cost of capital for each sub-sample may be computed by adding the reported differential in Column (5) to the cost of capital for the null set, ie, all other firms in the worldwide sample (10.115%, based on the sub-sample sizes, to give a weighted sum of costs of capital in Column (6) equal to 10.2%). Ignoring leverage effects and the differential cost of debt, just for the purposes of illustration, the single period dollar capital costs of financing total assets decrease in total by $146.40m for early voluntary adopters (-0.12% x $122.001bn) and increase in total by $255.52m for late voluntary adopters (+0.57% x $44.827bn).

TABLE 2 - The implied cost of capital: extrapolation of a single period economic effect based on Daske, Hail, Leuz & Verdi, 'Adopting a label: heterogeneity in the economic consequences around IAS/IFRS adoptions,' Journal of Accounting Research, 2013

(1)	N (2)	Sample (3)	Total Assets $m (4)	Difference in Cost of Capital (5)	Implied Cost of Capital % (6)	Cost of Capital Change % (7)	Single Period Effect $m (8)=(4)x(7)
Early Voluntary Pre-mandate	2,013	1.91%	512,711	+0.49	10.605		
Post- mandate	479	0.45%	122,001	+0.37	10.485	-0.12	-146.40
Late Voluntary Pre-mandate	353	0.33%	89,909	-0.16	9.955		
Post-mandate	176	0.17%	44,827	+0.41	10.525	+0.57	255.52
Mandatory	3,741	3.55%	952,833	+0.67	10.785		
Others	98,765	93.59%	25,155,446		10.115		
All	105,527	100.00%	26,877,727		10.200		

Note. The mean of Total Assets ($m) is reported by the authors as $1,273.50 million, and the median as $163.69 million. The full sample size is 105,527, for the five years 2001-2005, for which economic assets would sum to about $26,877 billion in the average year. Other things being equal, this would be partitioned across the full sample as in (4) above. The subsample for which cost of capital is calculated is 24,913 firm-years, for which the average cost of capital is reported as 10.2%. The cost of capital for each sub-sample may be approximated by adding the differential reported by the authors, as given in (5) above, to the estimate for the null set (10.115%) - the latter is based on the sub-sample sizes in (2), such that the weighted sum of costs of capital in (6) is equal to the 10.2%, as shown at the bottom of the column. Ignoring leverage effects and the differential cost of debt, these approximations suggest that, for the sample as a whole, the single period $ capital costs decrease in total by $146.40m for early voluntary adopters (-0.12% x $122.001bn) and increase in total by $255.52m for late voluntary adopters (+0.57% x $44.827bn).

We should emphasize that these are our rudimentary calculations based on the relevant information given in the research paper, and that our aim here is mainly to demonstrate the challenging process that is involved in drawing inferences about full economic impact from published work.

Our second example concerns the discretionary accrual effects that are estimated in another of the papers examined, by Noor Houqe and coauthors. As a first step, we produced our own calculation[3] of the Total Assets of the average firm in their sample in 2007, the last year of their test period, which is equal to $275.3m.

We use this estimate in order to evaluate the economic significance of an earnings management proxy, the Discretionary Net Accrual, ie, Accrued Revenues & Deferred Charges less Accrued Charges & Deferred Revenues, or alternatively Operating Income less Operating Cash Flow, where a negative discretionary accrual decreases reported income. The variable mean is expressed by the authors as a proportion of opening Total Assets, and is reported by them as -0.012. For the economic segment represented by the 2007 sample of 19,442 of the world's listed companies, this suggests discretionary accruals following the mandate of –$64,224m in total (-0.012 x 19,442 x $275.3m), as shown in the final column of Table 3.

TABLE 3 - Discretionary accruals: extrapolation of a single period economic effect, based on Houqe, van Zijl, Dunstan & Karim, 'The effect of IFRS adoption and investor protection on earnings quality around the world', The International Journal of Accounting, 2012

(1)	Variable mean (2)	Regression coefficient (3)	Predictive component (4)=(2)x(3)	Implied economic effect (5) $m p.a.
Pre-mandate Discretionary Accrual			+0.0445	+238,164
IFRS mandate (1,0)	0.500	0.001	+0.0005	+2,676
IFRS mandate (1,0) x Enforcement	0.5 x 5.428	–0.021	–0.0570	–305,064
Post-mandate Discretionary Accrual			–0.0120	–64,224

Note. From the information provided by the authors, the mean of Total Assets for this sample (at the beginning of the last year in their test period) may be calculated as $275.3 million. For the 19,442 firms involved, this suggests aggregate assets of $5,352,380m. The authors' statistical results show that, after the IFRS mandate, Discretionary Accruals are estimated to be -0.0120 of Total Assets, i.e. $64,224m in this sample as a whole. Half of the sampled firms are in jurisdictions subject to the IFRS mandate, and the reported coefficients suggest a one-off increase in Discretionary Accruals of 0.001 of Total Assets for those firms, i.e. $2,676m in the sample as a whole ($5,352,380m x 0.001 x 0.5). But similar extrapolation for the influence of Enforcement shows an overwhelming estimated counter-effect of -$305,064m ($5,352,380m x 5.428 x -0.021 x 0.5).

In the matched sample, 50% of the firms operated in jurisdictions subject to the IFRS mandate, and the authors used an index varying by country to capture the extent of perceived enforcement by jurisdiction (average index value, 5.428). Based on the variable means and the regression coefficients reported by the authors, as set out in columns (2) and (3) of Panel B, we can infer that the IFRS mandate caused +$2,676m of managed earnings overall, an earnings-increasing effect which is reported by the authors as statistically significant but which, in the context of our re-estimation, is not necessarily economically significant.

[3] The authors report the mean and standard deviation of the natural logarithm of Total Assets in dollar millions (5.109 and 0.885 respectively). Based on the theoretical expectation, we estimate Total Assets for the average sampled listed firm worldwide as $\text{Total Assets} = e^{5.109 + \frac{0.885^2}{2}} \times \$1\text{m}$. The sample in this case comprises 104,348 firm-year observations over the ten years 1998-2007, with the number of firms increasing to 19,442 by the end of the test period. We make another assumption (8% balance sheet growth p.a.) in order to back out an estimate of average Total Assets per firm at the beginning of 2007 of $275.3m.

This becomes clearer when we consider the magnitude of the additional earnings-decreasing effect, which is overwhelming in its economic impact (–$305,064m) and which, under the authors' research design, is entirely attributable to investor protection measures.

Again, these are our rudimentary calculations, based on a reading of the relevant information given in the published research report. Clearly, with access to the full data set, such analysis could be carried out with greater precision.

It is evident from these two illustrations that there is a need for more developed methods to provide the necessary link between the typical analysis employed at the firm level in empirical accounting research and the related outcome for the economy as a whole, which should be a key input into evidence-based policy analysis.

5. Conclusions

The above examples illustrate the challenging task of inferring economic effects at the aggregate level, even though large samples of firms should readily provide the information that is required. For accounting researchers with interests in the political and economic implications of regulation and standardisation, who may wish to model the kind of 'effects analysis' discussed by EFRAG, IASB and FASB, a useful list of issues in research method emerges from our own attempts to unravel the connections between statistically significant results and their economic significance, as follows.

- How can regression estimates be used to calculate aggregated effects for the sample and, by extrapolation, for the relevant economic sector, or the local or global economy?
- How can extreme values that have been omitted from estimation be reintroduced into the economic interpretation?
- Are fixed and random effects fully incorporated into the economic interpretation of results?
- How should inferences be drawn from transformed and scaled variables in order to draw conclusions about the observable variables?
- When estimates are transformed to probabilities, odds and expected counts, how are these links to be reinterpreted when inferring observable outcomes?

We would recommend that academic researchers pay more attention to the issue of economic impact, given the demand for such information from regulators and standard setters. The main finding of this study, that economic impact cannot be calculated easily from the available evidence, suggests that more discussion of economic significance is required, and that thought be given to presenting data so that economic significance can be determined. Finally, it would be helpful if published papers could give links to the detailed results (including results omitted due to space constraints), together with the researchers' data, on dedicated websites.

6. Further references and useful links

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About the authors

Stuart McLeay is a Professor of Accounting and Finance at Lancaster University and at the University of Sydney. He qualified as a chartered accountant in 1969, working with audit firms in Germany, France and Italy before joining the European Investment Bank. He was part of the Lancaster team that piloted international exchange schemes for accounting and business students in the EU, leading to the ERASMUS program, and has been involved in successive EU-wide doctoral research training programs, including coordination of the HARMONIA accounting research network. He has served as a member of the advisory panels of the ICAEW Research Board and the Financial Reporting Council, and received the Lifetime Achievement Award from the British Accounting and Finance Association in 2015.

Elisabetta Barone is a Senior Lecturer in Accounting at Brunel University London. She qualified as a chartered accountant and public auditor (Dottore Commercialista e Revisore Contabile) in Italy in 1994. She has a PhD from Bocconi University (Milan, Italy) and an MSc in Law and Accounting from the London School of Economics and Political Sciences. Her research focuses on IFRS adoption, and she has co-authored two accounting textbooks based on IFRS which have been adopted worldwide, coauthored with Jagdish Kothari, a former partner in PwC Milan.

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Appendix

Response variables estimated in the selected studies

	Response Variable	Authors	Journal	Year
1	Cost of Capital	Li	AR	2010
	Cost of Capital	Daske, Hail, Leuz & Verdi	JAR	2008
	Cost of Capital	Daske, Hail, Leuz & Verdi	JAR	2013
	Cost of Capital	Han & He	RAF	2013
	Cost of Capital	Kim, Shi & Zhou	RQFA	2014
2	Price Impact	Daske, Hail, Leuz & Verdi	JAR	2008
	Price Impact	Daske, Hail, Leuz & Verdi	JAR	2013
3	Bid-Ask Spread	Daske, Hail, Leuz & Verdi	JAR	2008
	Bid-Ask Spread	Daske, Hail, Leuz & Verdi	JAR	2013
4	Trading Cost	Daske, Hail, Leuz & Verdi	JAR	2008
5	Return	Devalle, Onali & Magarini	JIFMA	2010
	Return	Barth, Landsman, Lang & Williams	JAE	2012
6	Market-adjusted Return	Armstrong, Barth, Jagolinzer & Ried	AR	2010
7	Risk-adjusted Return	Chen, Young & Zhuang	AR	2013
8	Abnormal Return on Switch to IFRS	Karamanou & Nishiotis	JBFA	2009
9	Non-Announcers' Abnormal Return	Yip & Young	AR	2012
10	Abnormal Return Volatility	Landsman, Mayhew & Thornock	JAE	2012
11	Frequency of Zero Return	Daske, Hail, Leuz & Verdi	JAR	2008
12	Share Price	Barth, Landsman, Young & Zhuang	JBFA	2014
	Share Price	Devalle, Onali & Magarini	JIFMA	2010
	Share Price	Agostino, Drago & Silipo	RQFA	2011
	Share Price	Barth, Landsman, Lang & Williams	JAE	2012
13	Share Price Synchronicity	Kim & Shi	RAST	2012
14	Precision of Information	Kim & Shi	JIAR	2012
15	Market-to-Book Assets (Tobin's Q)	Daske, Hail, Leuz & Verdi	JAR	2008
16	Market-to-Book Equity	Morais & Curto	AAR	2009
17	Price Premium on Voting Shares	Hong	AR	2013
18	IPO Underpricing	Hong, Hung & Lobo	AR	2014
19	Abnormal Share Trading Volume	Landsman, Mayhew & Thornock	JAE	2012
20	Change in Ownership by Foreign MFs	DeFond, Hu, Hung & Li	JAE	2011
21	Analyst Following	Kim & Shi	JIAR	2012
	(Foreign) Analyst Following	Tan, Wang & Welker	JAR	2011
22	Change in Analyst Following	Byard, Li & Yu	JAR	2011

23	Analyst Forecast Error	Horton, Serafeim & Serafeim	CAR	2012
	Analyst Forecast Error	Houqe, Easton & van Zijl	JIATT	2014
	Analyst Forecast Error	Jiao, Koning, Mertens & Roosenboom	RFA	2012
	(Foreign) Analyst Forecasting Accuracy	Tan, Wang & Welker	JAR	2011
24	Change in Analyst Forecast Error	Byard, Li & Yu	JAR	2011
25	Analyst Forecast Dispersion	Horton, Serafeim & Serafeim	CAR	2012
	Analyst Forecast Dispersion	Houqe, Easton & van Zijl	JIATT	2014
	Analyst Forecast Dispersion	Jiao, Koning, Mertens & Roosenboom	RFA	2012
26	Change in Forecast Dispersion	Byard, Li & Yu	JAR	2011
27	Analyst Forecast Precision	Horton, Serafeim & Serafeim	CAR	2012
28	Probability of Foreign Fund Holding	DeFond, Hu, Hung & Li	JIAR	2012
29	Foreign Mutual Fund Ownership (%)	DeFond, Hu, Hung & Li	JIAR	2012
30	Inter-Firm Comparability	Yip & Young	AR	2012
31	Cash Flow	Barth, Landsman, Lang & Williams	JAE	2012
	One-Year Ahead Cash Flow	Atwood, Drake, Myers & Myers	JAPP	2011
32	One-Year Ahead Earnings	Atwood, Drake, Myers & Myers	JAPP	2011
33	Discretionary Accrual (abs.)	Doukakis	JAPP	2014
	Discretionary Accrual	Houqe, van Zijl, Dunstan & Karim	IJA	2012
	Discretionary Accrual	Chen, Tang, Jiang & Lin	JIFMA	2010
34	Probability of Reporting a Large Loss	Zeghal, Chtourou & Fourati	JIAR	2012
35	Probability of Reporting a Small Profit	Zeghal, Chtourou & Fourati	JIAR	2012
	Probability of Reporting a Small Profit	Ahmed, Neel & Wang	CAR	2013
36	Accruals Quality	Chen, Tang, Jiang & Lin	JIFMA	2010
37	Managed Earnings	Aubert & Grudnitski	RAF	2012
38	Managed Real Earnings	Doukakis	JAPP	2014
	Audit Fee	Kim, Liu & Zheng	AR	2012
39	Bank Loan Loss Provisions	Gebhardt & Novotny-Farkas	JBFA	2011
40	Number of Lenders per Loan Facility	Kim, Tsui & Li	RAST	2011
41	Amount of Loan Facility	Kim, Tsui & Li	RAST	2011
42	Loan Spread	Kim, Tsui & Li	RAST	2011
43	Credit Default Swap Spread	Bhat, Callen & Segal	JAAF	2014
44	CEO Turnover	Wu & Zhang	AR	2009
45	Probability of Announcing Adoption	Karamanou & Nishiotis	JBFA	2009
46	Probability of Adoption	Wu & Zhang	AR	2009
	Probability of Adoption	Kim & Shi	RAST	2012
	Probability of Adoption	Kim & Shi	JIAR	2012
	Probability of Adoption	Kim, Shi & Zhou	RQFA	2014

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Gillian Knight
Research Manager
Chartered Accountants' Hall
Moorgate Place
London
EC2R 6EA

T +44 (0)20 7920 8478
E gillian.knight@icaew.com
icaew.com/academic

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ICAEW
Chartered Accountants' Hall
Moorgate Place
London
EC2R 6EA
UK

T +44 (0)20 7920 8100
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