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ABSTRACT

The purpose of this study is two-fold: firstly, to analyze the benefits of implementing an enterprise resource planning (ERP) system and using eXtensible Business Reporting Language (XBRL) format to report in the banking industry considering the industry's specific risks and complexities. Secondly, to show that both, ERP and XBRL are necessary to successfully use Computer Assisted Audit Techniques (CAATs) while performing audit procedures to verify the compliance of certain crucial regulatory requirements. The study shows the possible consequences of not using CAATs to audit the compliance of loan loss provisions' regulatory requirements in Uruguay.

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1. Introduction

Banks are companies with specific risks and complexities (Rose & Hudgins, 2004). Financial institutions play an important social role in the financial inclusion process, which has recently become a global policy objective to improve the lives of the poor (Swamy, 2014). Financial inclusion is also a tool to monitor financial transactions and to expand the surveillance of regulators (de Koker & Jentzsch, 2013). Research analyzes moral hazard in the financial sector in relation to loans granted to clients that are not creditworthy, and to high-risk sophisticated financial products offered to financially unsophisticated clients (Dow, 2011). In this context, financial institutions operate in a highly-regulated business because those institutions capture public savings. During a period of financial crisis, regulators increase their supervisory efforts to maintain financial stability.

To address the complexity of the banking business operations and regulations, financial institutions heavily rely on information technology (IT) to process the data (Chowdhury, 2003). Enterprise resource planning (ERP) systems are useful to align business process and IT and also have compliance and regulatory functionalities that can help banks to address regulatory requirements.

The rapid change in the current business environment conditions require companies to have innovative, flexible, and agile systems and

processes (Kloviene & Gimzauskiene, 2015). ERP systems help an organization to deal with administrative and core-business processes (Kanellou & Spathis, 2013). One of the main advantages of ERP systems is that they unify data that comes from different functional areas in the company (Hedman & Borell, 2004), thus avoiding inconsistencies and mistakes in the information the company uses to operate.

Using a survey to study the ERP usage in the 1000 largest banks worldwide, Fuß, Gmeiner, Schiereck, and Strahringer (2007) find that about half of the participating banks use an ERP system, mainly SAP (53.6%), Oracle (19.6%), and PeopleSoft (10.7%) as a way to increase information transparency and quality and to develop more efficient business processes.

The Bank for International Settlements (BIS) identifies loan loss provisions (LLP) as an account having significant risk of material misstatement (Bank for International Settlements, 2013). LLP relate to assets quality because the higher the provisions the lower the loans quality. Recently, the criticism toward bank provisioning practice is increasing, partly in response to the perceived failure of banks prior to the recent financial crisis, to anticipate losses that are not identifiable from current exposures (Dahl, 2013).

The potential of data analytics to help auditors to gather evidence about LLP is quite significant. However, the adoption of data analytics in accounting firms' auditing practices is slower than in other fields (Whitehouse, 2014) and in this line, additional research is necessary to understand how the adoption of data analytics impacts on the audit firm from the standpoint of being subject to regulatory sanction (Earley, 2015).

This study looks into recent filing requirements for banking institutions using the eXtensible Business Reporting Language (XBRL), and reflects on its potential together with an ERP in this specific sector. This

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research draws on a literature review and a case study approach. A case study supports the theory and is suitable to examine the questions of “how” and “why” (Yin, 2003). The objective of a case study is to build a theory in the preliminary phase of a research study and to find new research avenues. This study analyzes the benefits of implementing an ERP system and of using XBRL format to report in the banking industry considering the industry’s specific risks and complexities. The study posits that ERP and XBRL both are necessary to successfully use Computer Assisted Audit Techniques (CAATs) while performing audit procedures to verify the compliance of certain crucial regulatory requirements in banking. Using information from Big 4 auditors that audit banks in Uruguay, this study confirms this statement by explaining the possible consequences of not using CAATs to audit the compliance of loan loss provisions’ regulatory requirements in Uruguay.

2. The use of ERP and XBRL in the financial sector

Disclosing into XBRL the financial data integrated through the implementation of an ERP system (Liu, 2013) makes that data available to outside users such as stockholders and regulators (Kloeden, 2007). In addition, banks can also significantly reduce the time and costs of data manipulation while performing the key business processes. Because financial institutions deal with a high volume of financial information, they can take a big advantage of the XBRL technology (Tesnière, Smith, & Willis, 2002).

Since October 2005, the Federal Financial Institutions Examinations Council (US Banking Regulator) requires quarterly “Call Reports” in XBRL; a requirement that 8,000 banks must comply (KPMG, 2008). This requirement implies that banks must collect, validate, manage, and distribute data into a central data repository accessible to regulators and the public. The rate of data free of mistakes submitted can measure the success of project implementation: research reports that 95% of bank data submitted is free of errors (Jones, 2013).

The European regulator has also implemented XBRL to receive information from the supervised entities (European Banking Authority, 2013). The Banco Central del Uruguay (the Uruguayan banking regulator) leads a recent XBRL reporting initiative in South America, which is implementing XBRL reporting for the supervised institutions. Banks must report the 2015 financial statements in XBRL format by mid-2016 (Banco Central del Uruguay, 2016).

The financial sector is pioneer in the implementation and use of XBRL to exchange financial information in a standard format. The success in this sector motivates other regulators such as the Security and Exchange Commission (SEC) to mandate all public companies to disclose their financial information using XBRL since 2009 (see for instance the benefits for financial analysts in Liu, Yao, Sia and Wei (2013) and Liu, Wang and Yao (2013), and the effect in the decrease in the systematic risk of banks or the effects on liquidity in Blankespoor, Miller, and White (2012)).

After the recent financial crisis, requirements from regulators are significantly higher (Gandrud & Hallerberg, 2014), giving a higher level of complexity and importance to the financial institution’s risk management function. ERP systems and XBRL can help financial institutions to comply with these new and complex requirements such as Basel policies, Sarbanes-Oxley Act, and IFRS.

3. Risk management in the banking industry

Regulators commonly use the CAMELS rating system to assess the strength of financial institutions and to evaluate their risk level (Office of the Comptroller of the Currency, 2013). The CAMELS rating covers the following risk areas: The level of capital risk, the quality of assets, managerial skills, the level of earnings and profitability, the level of liquidity risk, and the sensitivity to market risk. Prior studies in the banking research identify proxies for the different risk areas that the CAMELS rating system covers (Gambetta, Zorio-Grima, & García-Benau, 2015).

These proxies use banks’ financial information. The use of ERP and XBRL can help not only the financial institution but also the regulators to monitor the different types of risk that are inherent to the banking industry.

Research commonly uses the capitalization ratio to capture the capital adequacy. Capitalization ratio equals total equity to total assets (Jin, Kanagaretnam, & Lobo, 2011). Loan loss provision (LLP) captures asset quality. The higher the LLP the lower the asset quality (Jin et al., 2011; Kerstein & Kozberg, 2013). The efficiency ratio defined as cost to income is a common proxy for management skills (Fields, Fraser, & Wilkins, 2004). The ratio of operating income to total assets is a proxy for earnings and profitability (Fields et al., 2004). Other ratios such as return on assets and return on equity are proxies for earnings and profitability (de Claro, 2013; Martínez-Campillo, Cabeza-García, & Marbella-Sánchez, 2013). Total loans is a proxy for bank liquidity, because the main factors in the financial crisis are a loss in liquidity and an increase in the default risk of loans from interest rate resets (Kerstein & Kozberg, 2013). Additionally, total liquid assets are a proxy for liquidity.

The financial institution itself and auditors can use all the above risk proxies to monitor the compliance of the requirements of regulators, who can also take advantage of these proxies to monitor compliance of financial institutions with regulatory requirements.

4. High-risk areas in banking compliance: the auditor’s role

A simplification of the regulatory requirements compliance and the monitoring using the CAMELS approach could exist if the financial institution has an ERP system and reports under XBRL. The use of XBRL also makes the supervisory activity easier for the regulator, because the regulator receives the information in a standardized format with IT usage potential. Note that XBRL improves information re-usability: As the production costs diminish, the reliability and processing speed increases, yielding more accurate, timely, and informed regulatory assessments and analytics. As a result, XBRL substantially enhances the efficiency of these assessments (Efendi, Dong Park, & Murphy Smith, 2014).

Another important stakeholder in the banking sector is the external auditor. Auditors use data analytics to test a greater number of transactions, to increase the audit quality by providing greater insights into the clients’ processes, and to detect fraud. Using data analytics, auditors can easily increase the sufficiency of audit evidence and can identify data that does not match the auditors’ expectations based on their knowledge of the client’s business (Earley, 2015). Audit standards suggest that the use of CAATs may enable more extensive testing of electronic transactions, which may improve audit efficiency and effectiveness (IFAC, 2010). In a recent study about the factors that influence auditors’ use of CAATs in the United States, Bierstaker, Janvrin, and Lowe (2014) obtain data from 181 auditors representing Big 4, national, regional, and local firms and show that CAATs use may be dependent on predictable cost effectiveness tradeoffs.

LLP are accounting estimates; therefore, they have high risk of material misstatement. Banks make complex calculations using information from different sources to estimate them, while the auditor performs extensive audit procedures to audit these high-risk accounts. The regulator also assesses these processes using the CAMELS rating-system approach, where the letter A identifies assets quality.

Auditors with high reputation have incentives to provide high quality audits to mitigate reputation and litigation risk. Given that LLP is a significant accrual for banks and given that LLP is an accounting estimate with high inherent uncertainty associated, bank managers use judgment and inside information to estimate LLP. Thus, auditors are important to mitigate information asymmetry between bank managers and stakeholders such as investor and regulators (Kanagaretnam, Krishnan, & Lobo, 2009). LLP ranks number one among the main deficiencies regulators find (AICPA, 2006). This rank indicates that auditing LLP is challenging and audit quality is important in assessing LLP’s adequacy.

5. Regulatory requirements regarding LLP in Uruguay

In September 2001, Uruguay introduces dynamic loan loss provisioning (Wezel, 2010), following the Spanish model (Pérez, Salas-Fumás, & Saurina, 2011) launched the previous year. The regulation specifies that banks contribute to their individual dynamic provisioning funds with the difference between the monthly statistical net losses on loans to the non-financial private sector (NFPS) and the realized net loan loss in that month.

The statistical losses result from multiplying 1/12 of the expected rate of loss for three loan categories (1C, 2A, 2B), ranging from 0.4% to 1.5% and from 0.7% to 2.3% by the respective loan volumes and loan volumes variations, respectively. The calculation of the net loan loss incurred in a given period comprises the cost of additional specific provisions recorded in the profit and loss statement, net of deactivations of specific provisions (i.e., reclassifications of loans toward higher categories), and recoveries of defaulted loans already written off (Banco Central del Uruguay, 2014; Wezel, 2010). The dynamic provisioning fund (reserve) has a limit.

The test of detail that the external auditor designs to verify the sufficiency of the dynamic provision reserve (credit portfolio valuation) consists of:

- calculating the specific provision (the realized net loan loss)
- calculating the statistical provision (the statistical net losses)
- comparing the specific provision and the statistical provision, verifying that when the second is greater than the first, the banks should increase the dynamic provision fund by the amount of such difference and reduce the fund in that amount if the opposite situation occurs, and
- verifying the dynamic provision cap compliance

Table 1 shows the specific LLP percentage applied to the different credit categories (including commercial, personal, and mortgage loans) (Banco Central del Uruguay, 2014).

The auditor needs to verify that the categorization of each client in the credit portfolio is correct according to the regulator's policy guidelines. To do so, the auditor selects a sample of clients that the regulator determines and verifies that those clients meet all the requirements of the assigned category. The requirements of each category refer to:

1) Objective criteria: refers to the past due days of the different credit type (Table 2).

Additionally, the debtor has to file financial information within the 120 days following year-end. If after this period the debtor does not file this information, the category assigned will worsen as past due days increase.

2) Subjective criteria, the auditor must assess the following items:

- 2.1) Repayment capacity: the capacity of the debtor to generate current and future cash flow to repay its debts. In the case of an economic group, the auditor must assess the group capacity by assessing the following items: a) financial position: solvency,

Table 1

LLP percentage applied to credit categories.
Source: Banco Central del Uruguay.

Credit category	Description	% Provision
1A	Credit operations with highly liquid collateral	0%
1C	Debtors with strong repayment capacity	0.5%–1.4%
2A	Debtors with appropriate repayment capacity	1.5%–2.9%
2B	Debtors with potential problem in the repayment capacity	3%–16.9%
3	Debtors with compromised repayment capacity	17%–49.9%
4	Debtors with highly compromised repayment capacity	50%–99.9%
5	Bad loans	100%

Table 2

Credit category according to the past due days of loan types.
Source: Banco Central del Uruguay.

Credit category	Past due days		
	Commercial loans	Personal loans	Mortgages
1A	–	–	–
1C	0–9 days	0–9 days	0–9 days
2A	10–29 days	10–29 days	10–29 days
2B	30–59 days	30–59 days	30–59 days
3	60–119 days	60–89 days	60–179 days
4	120–179 days	90–119 days	180–239 days
5	More than 179 days	More than 119 days	More than 239 days

leverage, quality of assets, liabilities, equity and contingencies, profitability, organizational and strategic aspects, quality of information, pending lawsuits; b) industry risk; c) foreign currency position; d) interest rate risk.

2.2) Repayment experience: assessment of the debtor repayment experience of fiscal and financial debts.

2.3) Country risk: This is the risk that the current economic and political situation of the debtor's country affects the debtor's capacity to repay its debts.

The auditor must assess the repayment capacity in adverse and highly adverse scenarios in two levels (general and industry-specific), preparing prospective financial statements for at least the following year (or for the loan period if this is greater than one year). To prepare the prospective information in both levels, the regulator requires the bank to consider the variables in Table 3.

In the industry-specific level, the auditor must consider industry-specific variables in the repayment capacity analysis in both scenarios. These variables must be proxies for the type of goods and services the debtor commercializes, mix of local sales and exports, market share, cost structure, and industry growth rate, to name a few.

The debtor keeps the repayment capacity in each scenario in each level if he or she meets all of the following criteria: a) cash flow from operations in the prospective financial statement is sufficient to pay the debt's interest; b) equity is positive; c) at the beginning of the prospective financial year, the financial debts are less than net operating assets, or, if this is not the case, the excess of financial debt is less than the cash flow from operations remaining after paying interests; and d) the working capital does not decrease in the prospective financial statement. If a decrease exists, this decrease is proportional and related to a decrease in the debtor's operations.

6. Information needed to assess the sufficiency of LLP

Based on information from Big 4 auditors, and considering the complexity of the LLP estimate, the external auditor needs the following data to perform the test of detail to assess the LLP sufficiency:

- the bank's financial statements,
- the credit portfolio inventory that includes: customer number, type of credit, amount, currency, interest rate, settlement date, due date, number of installments, collateral type, collateral amount, last

Table 3

Variables considered to prepare the prospective information in the adverse and highly adverse scenarios.
Source: Banco Central del Uruguay.

Variables	Scenarios	
	Highly adverse	Adverse
Depreciation rate of the Uruguayan peso	35%	20%
Gross domestic product variation (GDP)	–6%	–3%
6 month Libor basic points increase	300	100

payment date, last installment paid, loan loss reserve and category (calculated according to the guidelines described in Section 5),

- collaterals' inventory,
- debtors' inventory that includes identification data for each client such as: customer number, surname, name, address, ID number, industry, year-end, auditor, and type of opinion,
- debtors' collateral file containing all the documents related to the loan's collaterals, and
- debtors' file containing documentation related to the credit transaction and all "Know your customer" (KYC) information including: debtor's activity information, loan contract, financial statements (for the last three financial years), scenario analysis done by the bank, credit analysis done by the bank, credit committee approval, and rationale for the category assigned.

If the bank uses an ERP system, the bank should store all this information in a single database, and if the bank and the debtors are using XBRL to report, all the financial information and data analysis will be in a standard format, which facilitates the auditor's use of CAATs to perform the audit procedures.

7. The need to use CAATs to audit the compliance of LLP

Generalized audit software (GAS) is a type of CAATs that helps auditors to perform data extraction, querying, manipulation, and analytical tasks (Boritz, 2003; Braun & Davis, 2003). Assessing the sufficiency and compliance of LLP would be difficult without using a GAS such as IDEA (Interactive Data Extraction and Analysis) or ACL (Audit Command Language). Surprisingly, Debreceny, Lee, Neo, and Toh (2005) find that external auditors from major accounting firms that are in charge of the audit of major banks in Singapore do not use GAS. A possible reason could be the early stage of XBRL development at that time or the use of other audit procedures to gather sufficient and appropriate audit evidence. However, recent evidence in Italy corroborates a very limited interest and use of XBRL by auditors in the Big-4 (La Rosa & Caserio, 2013). In a recent study, Bierstaker et al. (2014) find that auditors working for Big 4 firms are significantly more likely to use CAATs than those working for smaller firms because the former are more likely to audit larger clients who possess more complex IT, driving them to use CAATs, and because Big 4 firms have more resources available to invest on CAATs.

To audit LLP accounts, external auditors need to use CAATs to perform the following procedures:

- to reconcile the loans portfolio's inventory and the collaterals' inventory with the financial statements;
- to draw a representative sample of credits to perform the assessment;
- to perform the scenario analysis in the general and industry-specific level in both scenarios, adverse and highly adverse, to assess the repayment capacity. This step requires using the regulator's variables and the auditor's variables for the industry-specific level in both scenarios;
- to compare the category the bank assigns to each debtor included in the sample with the category that results from the auditor's assessment;
- to calculate the realized net loan loss;
- to calculate the statistical net losses;
- to compare the realized and the statistical net loan losses;
- to calculate the need to increase or decrease the dynamic provisioning fund; and,
- to verify that the dynamic provisioning fund does not reach the cap.

A possible explanation for not using GAS in performing these audit procedures could be that the bank does not provide the data in a standardized format to feed the data in the audit software. This situation could take place if the bank does not use an ERP system and does not report using XBRL.

8. The possible consequences of not using CAATs to audit the compliance of LLP

Not using GAS to perform this type of complex audit procedures increases the detection risk and could have significant negative effect on the audit. The loans and LLP balances are material because they relate to the main business of a bank. Detection risk can increase also if the auditor uses CAATs but the bank does not use ERP and XBRL, because the quality of the information provided to the auditor is very low.

A misstatement in these accounts could imply a non-compliance with certain regulatory requirements. The most common mistakes auditors make while performing audit procedures in the potential scenarios mentioned above are the following.

- The sample results from a credit portfolio inventory that does not reconcile with the financial statements; therefore, the sample is not representative of the population.
- The collaterals' inventory does not reconcile with the financial statements.
- The sample is not sufficient and does not comply with the minimum scope the regulator requires.
- The scenario analysis in the general and industry-specific level is weak because the bank considers only a few variables to prepare the prospective information. As a consequence, the assessment of the repayment capacity is not adequate and the auditor assigns the debtor to an inappropriate category.
- The realized net loan loss calculated is not appropriate.
- The statistical net loan loss calculated is not appropriate.
- The dynamic provisioning fund cap is not verified accordingly.
- The movement of the dynamic provisioning fund the auditor calculates is inappropriate.

These mistakes could result in the insufficiency of the LLP affecting the credit portfolio valuation and causing non-compliance with the regulatory requirements that could result in sanctions for the bank and the auditor.

9. Discussion and implications

The specific risks and complexities of the banking business evidences the need for banks' use of ERP and XBRL to enhance auditors success in using CAATs to audit banks' high risk areas. A description of the complexity and risk that the LLP system implemented in Uruguay implies illustrates this statement. Auditors play a very important role in this field because if an auditor does not detect a misstatement through test of details involving data analytics could potentially result in a regulatory sanction, which could range from fines to the bank and the auditor to banning the auditor to audit regulated financial institutions.

All economic agents should realize the opportunities XBRL and data analytics bring. In order to speed up this process, policy-makers could take some important measures:

- inclusion of XBRL and data analytics in the accounting degrees' curriculum and in the certification exam to become a registered external auditor,
- auditor training in XBRL and data analytics use,
- specific auditor training in regulatory requirements related to LLP estimate and potential sanctions for non-compliance,
- explicit reference to XBRL and data analytics in the audit standards and
- a standard XBRL taxonomy that all stakeholders would have to use.

The findings are useful for banks because they show bank management the potential benefits of using ERP and XBRL reporting to the

audit outcome; to auditors, because the findings show the potential use of data analytics to audit high risk areas such as LLP; to regulators, because the findings show the potential misstatements resulting from the absence of ERP, XBRL, and data analytics in a bank's high risk area; and to educators and students because the findings show the benefits of IT in the audit of bank's high risk areas.

This study draws on a literature review and information from Big 4 auditors that participate in banks' audit in Uruguay. A limitation of this study is the lack of empirical application of the findings; however, this limitation constitutes an opportunity for future research. Researchers can use the same method to study the effect of data analytics to audit the remaining banks' high risk areas included in the CAMELS risk approach.

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