An Analysis of loan loss provisioning behaviour in Vietnamese banking

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Abstract

This paper investigates loan loss provisioning (LLP) behaviour by Vietnamese banks during the period 2006-2012. We test the capital, income-smoothing and cyclical management hypotheses and examine whether the inclusion of X-efficiencies and/or risk control variables influences provisioning behaviour. When the X-efficiency estimates are incorporated into the models, Vietnamese banks do not exhibit counter-cyclical or capital management manipulation by managers, but counter cyclical income smoothing. Yet, the inclusion of risk control variables in x-efficiency scores (either equity or reserves for impaired loans) supports the addition of capital management hypotheses.

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1. Introduction

Given the complex trade-offs between capital, risk, efficiency and ultimately profit there are delicate yet important decisions to be made by bank managers as to the past, present and future risk appetite of the bank. These managers are reliant on financial accounting metrics to make informed decisions whilst being constrained in their decision-making by uncertainty and regulations governing the safety and soundness of these banks (Bushman and Williams, 2012). However, this reliance should not be overstated as the ability to influence and align metrics to the strategy of the firm, better known as 'earnings or capital management', instead of the other way round, is well documented within the existing literature (Fonseca and González, 2008).

One such metric, Loan Loss Provisions (LLP), acts as a best estimate by the banks' managers as to the expected losses on their loan portfolios i.e., when customers default. However, the knock-on effect of this 'management' is that any upward movement in 'general' LLP will generally increase Tier 2 capital under the Basel Capital Accord 'rules' (Basel Committee, 1988), although this will be at the expense of net income and profits as tax-deductibility is confined to 'specific' LLP.

This may give the impression of financial stability and safety to regulators but the manipulation of profit and efficiency of the firm requires further investigation. This is particularly interesting in countries where regulatory capital controls are considered less exacting, as in Vietnam, as it gives managers more freedom to influence such metrics at a time when domestic credit had grown from 35% of GDP in 2001 to 120% by 2010. Furthermore, the fundamental lack of a securitisation and CDO market in Vietnam during the period under investigation could make such metrics even more important as credit default risk is retained on the issuing banks' balance sheets. Hence, banks can manipulate their equity capital instead of incomes (whether through pro- or counter-cyclical measures or income-smoothing) to cover expected losses through X-efficiency improvements in their overall business models.

This study thus provides important clarification on model specification for LLP testing in future research studies. Vietnam provides an interesting and somewhat unique arena from which to test these models, not only due to its neglect in previous analysis but also due to its rapid evolution over the testable period. With international regulators and Basel III legislation currently focussing on institutional safety and the relationship between LLP and losses in an attempt to phase out income-smoothing, it seems rational for future studies to pay attention to the results and methodological insights of this current study.

2. Model and Data

Since LLP and loan growth change over time and their values at time *t* are likely to be affected by their lagged terms, it is more appropriate to use dynamic panel data analysis than a static panel data analysis with fixed/random effects (a recent example of the latter include Bushman and Williams, 2012) . That is, our base-combined model is:

$$LLP_{it} = \alpha + \sum_{j=1}^{J} \alpha_j \, LLP_{it-j} + \beta(L)X_{it} + \eta_i + \varepsilon_{it} \qquad (1)$$

Where $(L)X_{it}$ is the lag polynomial of business cycle, income smoothing, risk management and x-efficiency variables, η_i are individual bank specific effects and ε_{it} is an error term and where the subscripts $i = 1, .., N$ and $t = 1, ..., T$ denote the cross sectional and time dimensions of the panel. However, given the inclusion of a lagged dependent variable in the equation to be estimated, the standard error estimators are inconsistent since the unobserved panel-level effects are correlated with the lags of the dependent variables. By first differencing (Δ) equation (1) this eliminates the unobserved bank-specific effects by taking the first differences and captures the dynamic nature of the models by allowing for the inclusion of lagged dependent variables, equation (2).

$$\text{LLP}y_{it} = \sum_{j=1}^{J} \alpha_j \, \Delta LLP_{it-j} + \beta(L)\Delta X_{it} + \Delta\varepsilon_{it} \qquad (2)$$

This is the common, Generalized Method of Moments (GMM) developed by Arellano and Bond (1991) and Arellano-Bover/Blundell-Bond (1995, 1998), our model constitutes an unbalanced sample of Vietnamese banks over the period 2006 to 2012, hence covering pre WTO introduction and pre and post Global Finance Crisis (GFC). Indeed, our GMM model incorporates jointly, business cycle, income smoothing and capital management hypotheses, rather than separately estimating these hypotheses in line with Anandarajan et al. (2007) and Ghosh (2007). Our complete specification is therefore:

$$LLPTA_{it} = const + \alpha_1 LLPTA_{it-1} + \beta_1 xeff_{it} + GDPG_t + \kappa_2 UNEMP_t + \kappa_3 NETITA_{it} + \kappa_4 TCEQTA_{it} + \kappa_5 NOFFBSTA_{it} + \kappa_6 LADEP_{it} + \kappa_7 LODEP_{it} + \kappa_8 CDTF_{it} + \varepsilon_{it}. \qquad (3)$$

Where,

$LLPTA_{it}$ = LLP for bank *i* at time *t*

$LLPTA_{it-1}$ = captures the autoregressive component in the emergence of doubtful loans and dynamic adjustment of LLP,

$GDPG_t$ = GDP Growth testing for counter or procyclicality

$UNEMP_t$ = Unemployment Rate testing for counter or procyclicality

$NETITA_{it}$ = Net income to determine the extent to which LLP is based solely on the level of earnings

$TCEQTA_{it}$ =Total common equity testing for Capital Management Hypothesis

$NOFFBSTA_{it}$ = Net off balance sheet income,

TA_{it} = Total assets, used to scale bank specific variables, In addition, we also include specific risk factors to account for any potential feedback through the management process of Vietnamese banks,

$LADEP_{it}$ = liquid assets to total deposits,

$LODEP_{it}$ =total loans to total deposits

$CDTF_{it}$ = customer deposits to total funding less derivatives.

ε_{it} = a standard i.i.d error. For the summary statistics see Table 1 below.

Table 1. Dynamic Loan Loss Provisioning Model - Summary Statistics

	Mean	Minimum	Maximum	St. Dev
LLPTA	0.3913	-0.4846	1.9238	0.3907
GDPGR	6.0892	5.2500	7.1300	0.6656
UNEMP	2.2258	2.0000	2.4000	0.1502
NETITA	1.2108	0.0428	5.9518	0.7823
TCETA	12.9264	1.0100	79.9700	10.5927
NOFFBSTA	0.7414	-0.7849	4.6623	0.6604
LADEP	38.6505	7.8600	398.5800	31.8008
LODEP	99.2318	23.5100	351.8700	42.2610
CDTF	65.2606	15.6300	100.0000	16.3748
xeff	0.8453	0.4481	0.9950	0.1462
xeffEQ	0.7346	0.3741	0.9639	0.1423
xeffRIL	0.7075	0.3821	0.9584	0.1438

Where: LLPTA denotes (Loan Loss Provisions / Total Assets) × 100; GDPGR, GDP growth; UNEMP, unemployment rate, NETITA, (Net Income / Total Assets) × 100; TCEQTA, (Total Common Equity / Total Assets) × 100; NOFFBSTA, Net Off-Balance Sheet Income / Total Assets) × 100; LADEP, (Liquid Assets / Total Deposits) × 100; LODEP, (Total Loans / Total Deposits) × 100; CDTF, (Customer Deposits / Total Funding) × 100; xeff are efficiency scores without risk variables; and xeffRIL and xeffEQ are efficiency scores from the distance function including Reserves for Impaired Loans and Equity as risk management control variables, respectively.

One of our extensions to the literature is to test the hypotheses that either three different specifications of efficiency $xeff_{it}$ have an effect on managerial behavior in relation to LLP (see Boutin-Dufresne et al, 2013). To estimate the X-efficiencies of Vietnamese banks we utilise the stochastic parametric distance function approach (Rezitis, 2008; and Sturm and Williams, 2008). The input-oriented distance function can be interpreted as the greatest radial contraction of the input vector, with the output vector held fixed, such that the input vector still remains in the input requirement set $V(y)$:

$$D_I(x, y) = max\{p: (x/\rho) \in V(y)\} \quad (1)$$

where the distance function $D_I(x, y)$ will take a value which is greater than or equal to unity if the input vector (x) is an element of the feasible input set and will take a value of unity if x is located on the inner boundary of the input requirement set. The 'Base' stochastic frontier model can be specified as follows:

$$\ln D_{It} = const + \sum_{i=1}^{3} \alpha_i \ln y_{it} + \frac{1}{2} \sum_{i=1}^{3} \sum_{j=1}^{3} \sigma_{ij} \ln y_{it} \ln y_{jt} + \sum_{m=1}^{3} \beta_m \ln x_{mt}$$
$$+\frac{1}{2} \sum_{m=1}^{3} \sum_{n=1}^{3} \gamma_{mn} \ln x_{mt} \ln x_{nt} + \sum_{i=1}^{3} \sum_{m=1}^{3} \delta_{im} \ln y_{it} \ln x_{mt} + \tau_1 T + \tau_2 T^2. \quad (2)$$

The normal homogeneity and symmetry restrictions are imposed following the re-parameterisation of the distance function, following Drake and Simper (2003). With respect to the inputs and outputs used in the estimation of the distance function, we follow the traditional intermediation approach of Sealey and Lindley (1977); for recent examples see Beccalli and Frantz (2009), Fukuyama and Weber (2009) and Wheelock and Wilson (2012). A rationale for following the intermediation approach for Vietnamese banking lies in their legal definition in which a '*Bank means a type of credit institution which may conduct all banking operations'* including '*deposit taking*', '*credit extension*' and '*provision of services of via-account payment*' (Law on Credit Institution, 47/2010/QH12). Given this definition we use three inputs: total interest expense, personnel expenses and other operating expenses and three outputs, customer loans, interbank business loans, and off-balance-sheet & total securities business - following Shin (2009) and Bushman and Williams (2012).

We also include linear (T) and quadratic (T^2) time trends to account for systemic changes in bank optimisation based on technical change (Goddard et al, 2014). In addition to the Base model we also estimate a further two distance functions that include either Reserves for Impaired Loans (Model 2) or Equity (Model 3) which account for the risk management of Vietnamese banks. These determine whether our Base model and hence GMM specification is robust to the exclusion/inclusion of these risk management variables which have been found to have an influence on bank efficiency scores in the literature, however, as yet there is no agreement on which is most suitable.

Finally, as we wish to use the results from the efficiencies obtained from the distance function in a regression on loan loss provisions, it is necessary to ensure the technical efficiencies are a gross measure. That is, we want the efficiencies to be weakly exogenous (or predetermined) to LLP, hence allowing us to directly test whether LLP has a counter/pro-cyclical nature and if X-efficiencies have a direct effect on LLP over the business cycle. This is undertaken, by estimating the Battese and Coelli (1995) technical efficiency effects model in which we allow for the impact of Z_{it} bank specific and macroeconomic variables by entering the efficiency term μ_{it}, where $\mu_{it} \sim N(m_{it}, \sigma^2_{\mu_{it}})$, m_{it} takes the linear form $m_{it} = Z_{it}\delta_i + \omega_{it}$, with Z_{it} a $(p \times 1)$ vector of variables which may influence the efficiencies, δ_i is an $(1 \times p)$ vector of parameters to be estimated and ω_{it} is a random variable $\omega_{it} \sim N(0, \sigma^2_{\omega_{it}})$, see Coelli et al. (1999). . The $Z_{it}'s$ include a dummies for listed, a controlled subsidiary and independent banks, number of ATM's per 100,000 adults (ATMs), domestic credit to the private sector by banks as % GDP (CREDIT), broad money growth (M2GR), and the risk premium on lending (RPREM).

Table 2. Distance Function - Summary Statistics

	Mean	Minimum	Maximum	St. Dev.
Y1: Gross Loans	28258.63	204.85	277450.39	47490.13
Y2: Loans and Advances to Banks	8742.39	30.11	54089.81	10755.13
Y3: Off-Balance-Sheet Assets	16521.99	41.10	84162.60	19390.20
X1: Interest Expenses	2950.57	12.39	26011.09	4307.30
X2: Personnel Expenses	425.22	5.57	5301.83	819.71
X3: Other Operating Expenses	393.57	10.55	3355.97	595.08
NX2 Reserves for Impaired Loans	990.06	2643.04	23491.40	0.1523
NX1: Equity	3728.46	397.52	19366.89	3654.81
Z1: ATMS	14.53	3.51	21.15	5.49
Z2: CREDIT	95.13	65.36	114.72	14.23
Z3: RPREM	4.07	1.99	7.03	1.79
Z4: M2GR	26.84	11.94	49.11	10.27

VND billion. Data deflated by GDP deflator. Official exchange rate VND 20,509.75 equalled $1 in 2011

4. Results

Our methodology employs a linear dynamic panel-data model which includes lags of the dependent variable as covariates and contains unobserved panel-level effects, fixed or random. Therefore, the estimator eliminates the unobserved bank specific effects by taking the first difference and captures the dynamic nature of the models by allowing the inclusion of the lagged dependent variable.

The independent endogenous variable, the x-efficiencies, were instrumentalised and tested for endogeneity, where we reject the null hypothesis of exogeneity for xeff at the 7.12%, xeffRIL at the 6.24% and xeffLEQ at the 5.74% critical level. The x-efficiencies were then instrumentalised with the first two lags of their own levels and by ‘net interest revenue/total assets’, ‘other operating income/total assets’, ‘net interest income/total assets’ and ‘net interest margin’ and assessed using the Angrist-Pischke multivariate F test which rejected the null hypothesis (F-tests equal to xeff 9.48 (p-value 0.00), xeffRIL 13.32 (p-value 0.00) and xeffLEQ 13.77 (p-value 0.00). Two post estimation tests were also conducted; the Hansen test of joint validity of the instruments and the second order serial correlation ‘Arellano – Bond’ (See Table 3 below for results). Finally the finite sample correction proposed by Windmeijer (2005) was implemented calculating corrected standard errors. .

In Table 3 we present estimates for Base, Model 2 and Model 3. We find by observing the signs of the macro variable coefficients that there is an insignificant relationship with GDPG (GDP growth) – thus indicating no counter/pro-cyclical provisioning behaviour, agreeing with Eng and Nabar (2007) for Hong Kong, Malaysia and Singapore. That is, our result is different to the positive relationship between GDPG and LLP found by Bouvatier and Lepetit (2008), Fonseca and González (2008), Ghosh (2007); Leventis et al (2012) and Wong et al. (2011). This result corresponds favourably with Vietnam implementing IAS 39, implying that objective evidence is required on loan impairments before loan loss provisions can be made, hence restricting the buffering across the economic cycle and exacerbating pro-cyclical LLP. In respect of the other macro-environment variable – the unemployment rate $UNEMP_t$ - it is found to be insignificantly correlated with LLP, see also Bikker and Metzemakers (2005). A possible explanation is that the unemployment rate does not act as a proxy for loan demand (Beatty and Liao, 2011), that is, a higher unemployment rate will not cause lower loan growth, as there’s less demand bank loans.

The income-smoothing hypothesis concerns the relationship between net income NETITA_{it} and LLP, where we find a significant negative relationship, as also found by Bouvatier and Lepetit (2008) and contrary to Packer and Zhu, 2012; Ghosh, 2007. Indeed, Leventis et al. (2011) argue that a negative relationship denotes more riskier banks whereby managers have more discretion over earnings and therefore do not buffer against the economic cycle as witnessed in Vietnam. That is, the general provisioning of banks does not explain fluctuations in Vietnamese LLP and its procyclical relationship with GDP.

Table 3. Tests of Loan Loss Provisioning Hypotheses

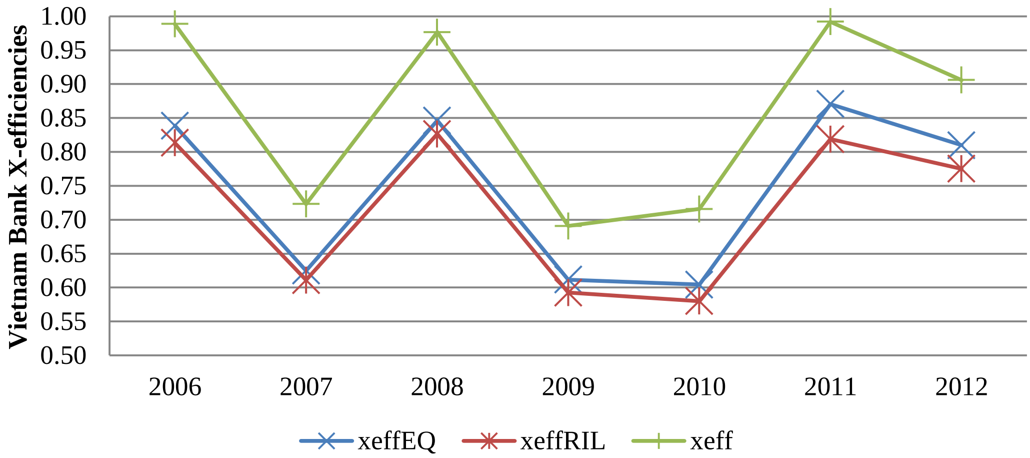
Coefficient	**Base Model**	**Model 2**	**Model 3**
Constant	-0.4930 (1.2721)	-0.1299 (1.4244)	-0.5152 (1.4157)
LLPTA_{t-1}	0.7050 (0.6113)	0.8372* (0.4808)	0.9716* (0.5677)
Xeff	1.0165** (0.4735)		
xeffRIL		1.0060* (0.5511)	
xeffEQ			1.0983** (0.5694)
GDPG	0.0945 (0.0973)	0.1182 (0.1201)	0.0974 (0.1216)
UNEMP	-0.4924 (0.4881)	-0.5376 (0.4678)	-0.3185 (0.4530)
NETITA	-0.2121* (0.1262)	-0.1965* (0.1039)	-0.2173** (0.0971)
TCEQTA	0.0204 (0.0141)	0.0238** (0.0105)	0.0277** (0.0106)
NOFFBSTA	0.2423 (0.1689)	0.1966 (0.1677)	0.1859 (0.1879)
LADEP	-0.0218** (0.0101)	-0.0240* (0.0121)	-0.0199* (0.0123)
LODEP	0.0093* (0.0055)	0.0058 (0.0037)	0.0052 (0.0042)
CDTF	0.0008 (0.0088)	0.0021 (0.0069)	-0.0011 (0.0063)
Wald statistic χ^2_{10}	103.58**	97.47**	79.74**
Arellano-Bond Order 1	z = -1.83* Pr>z = 0.07	z = -1.97* Pr>z = 0.05	z = -1.84* Pr>z = 0.07
Arellano-Bond Order 2	z = -0.31 Pr>z = 0.76	z = -0.23 Pr>z = 0.82	z = -0.28 Pr>z = 0.78
Hansen J-test	$\chi^2_{12} = 12.64$ Pr = 0.44	$\chi^2_{12} = 12.88$ Pr = 0.38	$\chi^2_{12} = 13.19$ Pr = 0.35

Standard errors are reported in parentheses, where ** denotes significance at the 5% and * at the 10% critical levels respectively. The null hypothesis for the Arellano-Bond test is no first and/or second order autocorrelation, p-values are presented. xeff are X-efficiency scores from the distance function excluding the risk management control variable, xeffRIL using Reserves for Impaired Loans and xeffEQ using Equity respectively. In our case, all models reject the LR test of a one-sided error null hypothesis and also reject the hypotheses that or 1 at the 5 or 10% critical levels (where γ=0.6274 in Base Model 1, γ=0.7536 in Model 2 and γ=0.7080 for Model 3). This indicates that input-orientated technical efficiency is important in explaining the total variability of inputs in Vietnamese banks.

With respect to the capital management hypothesis, TCEQTA_{it} is insignificant in the Base model showing that Vietnamese banks with low capital who utilise LLP do not boost their

Tier 2 capital positions. However, when we include x-efficiency scores that have additional risk management variables in the distance function $TCEQTA_{it}$ becomes significant. This linkage with the capital management hypothesis brings us nicely to the effect of x-efficiencies on LLP. A brief over-view of the x-efficiency scores in Figure 1 below shows that they closely follow the economic cycle that happened pre, during and post GFC where the main feedback occurred after 2008.

Figure 1. Average X-efficiency in the Vietnamese Banking Market



For example, average scores in 2008 equalled 0.9765 (Base model), 0.8265 (Model 2) and 0.8463 (Model 3) which subsequently dropped dramatically in 2009 to 0.6909, 0.5926 and 0.4908 and continued with low efficiency scores in 2010 equal to 0.7159, 0.5799 and 0.6044 respectively. Finally the results show that, on quick analysis of Figure 1, one can conclude that the X-efficiencies of Vietnamese banks are potentially model-dependent on whether risk management variables are included or excluded. For example, Shinhan Bank Vietnam has a x-efficiency scores in 2012 equal to 0.7790 (Base model 1), 0.4814 (Model 2) and 0.532 (Model 3). Hence, importantly for the inclusion of x-efficiencies in any secondary stage modelling, we purport that there is inter-temporal stability of scores across models, whether for the best or worst performing banks (individual efficiency scores available on request).

This further supports our modelling methodology in so much as any LLP models which exclude X-efficiency scorers could bias results – not on an individual bank level but at the industry specific analysis, an important finding.

In all the system GMM models, the X-efficiencies are found to be positively related to LLP and show that as managers reduce forecasting errors (the mis-allocation of resources from inputs to outputs) in their business models (thereby increasing X-efficiency), LLP increases. Furthermore, when risk management variables are included (models 2 and 3) TEQTA becomes significant, and across all models LADEP is negative and significant, thus now accepting the capital management hypothesis.

With respect to the net off-balance-sheet variable $\mathrm{NOFFBSTA_{it}}$, it is insignificant which is the opposite of that found in Kanagaretnam et al. (2003). Indeed, they argue that the relationship between net/gains losses on securities and LLP should be negative for income-smoothing. Their theory is, however, counter intuitive as we would expect two outcomes, either positive and significant or insignificant, as we have found. That is, as bank managers diversify away from traditional loans and mortgages into more off-balance-sheet items, then the risk profiles of banks change and potential losses need to be covered through profits and retained earnings. The conservative nature of Vietnamese banks implies that as $\mathrm{NOFFBSTA_{it}}$ increases they do not need to substitute the use of retained earnings to cover potential bad security investments with LLP, thereby smoothing their earnings. This relationship shows how potential losses and the change in banks' risk profiles are anticipated by banks as they move into securities and trading. Finally, the remaining two variables covering liquidity $LADEP_{it}$ and loan portfolio risk $LODEP_{it}$ are significant as expected.

5. Conclusion

In this paper we have shown the potential importance of including X-efficiency estimates when determining which hypotheses – capital management, counter or pro-cyclical and/or income-smoothing – bank managers seem to use to manipulate their bank income statements. However, all Models provide strong support for counter-cyclical income smoothing and pro-cyclical x-efficiency provisioning behaviour. In addition, pro-cyclical capital management behaviour is shown when risk variables are included in the estimation of the X-efficiencies. Indeed, as suggested by Hughes and Mester (1993), including equity in the X-efficiency estimation could reveal different risk aversion (or appetites) of the banks. That is, the minimum capital-asset ratio set by regulators will restrict the banks from operating at the cost-minimizing financial capital level, therefore affecting the efficiency level of the banks. Park and Weber (2006) meanwhile argue that given the ability to manipulate inputs and outputs, managers will consider the risk-return preferences of bank owners. As such, there is a choice to preserve equity capital by employing labour to monitor risky loans and investments, or take greater risk by employing less labour to lower costs and increase X-efficiency. Hence, the risk management control variable – equity – must be included to capture the management effect and the business model of the banks. Koutsomanoli-Filippaki et al. (2009) also argue that "if financial capital is ignored, the efficiency of banks that may be more risk averse than others and may hold a higher level of financial capital would be mismeasured, even though they are behaving optimally given their risk preferences" (page 561). All these arguments, together with our findings, support the case for including equity capital as a risk control variable in the modelling process.

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