

UK Government controls and Loan-to-Deposit ratio

Journal:	<i>Journal of Financial Regulation and Compliance</i>
Manuscript ID	JFRC-06-2021-0048.R1
Manuscript Type:	Original Article
Keywords:	Ring-fencing, financial stability, Loan to Deposit, banking regulation, liquidity risk

SCHOLARONE™
Manuscripts

UK Government controls and Loan-to-Deposit ratio

Abstract

- **Purpose** This paper presents an analysis of UK bank loans and deposits in tandem, linking the Loan-to-Deposit ratio to macroprudential policy and funding restrictions. Loan-to-Deposit ratio is used by micro and macroprudential authorities to address both structural (long-term) and cyclical (short-term) liquidity risks. It is an outcome of several political and economic factors and should be evaluated against this background.
- **Design/methodology/approach** We use Trend Analysis and Panel Regression to investigate Loan- to-Deposit ratio of Major British Banking Groups from 1945-2012 in the midst of changing UK government policies.
- **Findings** Our results show that wholesale funding, government intervention and repression were the major forces behind Loan-to-Deposit trends.
- **Originality** We recommend the use of LTD as a complement to other liquidity ratios in micro and macro prudential regulation particularly in the context of current reforms to banking capital requirements.

Key words: Loan-to-deposit ratio, Regression analysis, monetary policy, financial stability

JEL Code G01, G18, G210, G280, G230, E520

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

1.1 Introduction

Banks have traditionally provided liquidity on demand to borrowers in the form of loan commitments and to depositors in form of checking and other transaction accounts (Diamond, 1984; Gatev et al., 2009). Deposits create loans; an increase in deposit funding improves the liquidity position of banks (Berg, 2012) reciprocally, bank loans tend to create deposits, as the funds received by a borrower may end up in a customer deposit account. Thus, lending and deposit-taking are two manifestations of one primitive function: provision of liquidity on demand jointly analysed by way of Loan-to-deposit Ratio (Kashyap et al., 2002).

Loan-to-deposit Ratio (hereafter LTD) is a measure of the extent to which stable funds cover loans. When more loans are extended for stable deposits, banks risk their capability to fulfil their obligation towards deposit withdrawal as they then operate with a funding gap, which they may have to cover by sourcing funds in the wholesale financial markets (Van den End, 2016; Satria et al., 2016; Boďa and Zimkova, 2020). This has implications for bank liquidity, the interrelationship between the two sides of the balance sheet as well as bank level and system wide liquidity risk. If a substantial number of banks operate with a funding gap, adverse shocks to market funding can strain the banking sector, affecting credit supply and economic growth, as witnessed in 2008 financial crisis (Van den End, 2016).

Due to their profit motives banks tend to behave pro-cyclically (Satria et al., 2016), lending less in a recession, more during a boom. While this occurs because banks are aggressively pursuing profits, risk is underestimated in booms and overestimated in busts (Lowe, 2002; Lowe and Stevens, 2006). Thus, LTD tends to rise in good times when market funding is available to finance credit growth, levelling off in stressed market conditions, when credit growth diminishes; with consequences on the fragility

of the financial system. Micro and macro-prudential, monetary and macroeconomic policies may allow authorities to cushion the blow from financial crises (Elliot, 2011). As such governments impose counter-cyclical policies to enforce more prudent behaviour during boom by way of additional capital requirements to provide cushion for the potential losses incurred during busts (Vinals, 2011).

Theoretically, there is an optimal intermediation function given the level of liquidity that banks need to maintain (Satria et al., 2016). However, LTD as a measure of liquidity is only accurate if banks rely on third-party deposits for their source of funding which is rarely the case; when aggregate deposit inflows into banks weaken and banks' LTD widens (Acharya and Mora, 2015), banks tap into the wholesale funding markets to maintain profitability and liquidity.

LTD is fundamental to the liquidity transformation role of banks and is a core indicator for liquidity mismatch (Goodhart, 2013; Van den End, 2016). It is also an outcome of several political and economic factors; and should also be evaluated against this background. LTD ratio will fluctuate around its trend to reflect the short-term financial cycles, government policies and macro-economic factors. **While LTD may not be fully appreciated by the academic community, it is a regulatory standard used by central banks (Office of the Comptroller of the Currency, 2016; DiSalvo and Johnstone, 2017; European Banking Authority, 2017; Bod'a and Zimkova, 2020). Since the 2007-2008 financial crisis, there has been increasing focus on the use of LTD as a measure of liquidity and a tool for macro prudential policy to mitigate liquidity risk (Goodhart, 2013; Van den End 2016, Satria et al., 2016, Bod'a and Zimkova, 2020, 2021) and a predictor of bank vulnerability to crises (Jorda et al., 2021).** By way of Trend analysis and Panel Regression, we examine the impact of

changing severity of government controls on LTD ratio for the period 1945-2012 for Major British Banking Group (MBBGs)¹.

1.2 Historical View: Impact of UK Government policies

For the years 1945 -1970s the government adopted the 'start, stop and go repressive policies' imposing both qualitative and quantitative controls to restrict credit expansion. The controls were of varying stringency and were removed between 1958 and 1969, and 1971 and 1973 (McKinnon and Mathieson, 1981; Roubini and Sala-i-Martin, 1992). Interest rate control was the main tool used to manage money supply as the government adopted a 'cheap to neutral' monetary policy, resulting an increased demand for money, and subsequently borrowing (Woodford, 1998 and Gowland, 2013). Given this background, government lending constraints in this period were necessary to control monetary expansion (Partington, 1987). British banks responded to the government's requests as far as the direction of lending was concerned. This influenced banks' lending and funding mix and consequently LTD trends. Thus, a repressed financial sector discouraged not only saving (because of a ceiling on interest payments) but also investment due to a lower rate of return than otherwise could be obtained in competitive market. In this period banks maintained high levels of liquidity as they collected deposits and used them to buy government securities as government controls suppressed lending.

Cox (1966) and Jorda et al. (2021) indicate that banks were liquid after WWII as they held a large share of their assets in government securities, and government-imposed lending restrictions along with low interest environment were still in place as the government funded their debt cheaply. However, for periods 1958- 1969, and 1971-

¹ HSBC, Barclays, Lloyds Banking Group, Royal Bank of Scotland Group

1
2
3 1973 when lending restrictions were removed, demand for loans rose, and in the
4
5 process, banks increased their loan portfolios resulting in the whole system becoming
6
7 'loaned up'. In these periods, while banks decreased their holding of government
8
9 securities, deposits decreased, credit demand increased and thus a conducive
10
11 environment for an increase in bank LTD ratios.
12
13
14

15 While all the above discussed repressive and credit control policies focus on the asset
16
17 side of the balance sheet by imposing restriction on lending, banks responded by
18
19 taking more deposits. Government policies at the start of 1970s were designed to
20
21 boost competition among individual institutions by eliminating the earlier imposed
22
23 restriction specifically; lending control and ceiling (Brown, 1982; Grady and Weale,
24
25 1986). Consequently, the government in an attempt to control credit conditions with
26
27 greater scope for competition and innovation in the banking sector introduced the
28
29 Competition and Credit Control (CCC) over the 1970-1973 period (Goodhart, 2014).
30
31 Not only did this increase competition for deposits and liquidity in the banking sector;
32
33 but it also increased lending, money supply and inflation. Thus, the government's focal
34
35 point moved from the asset side to the liability side of the balance sheet by introducing
36
37 a penalty on banks whose interest-bearing deposits grew faster than pre-set limit.
38
39
40
41
42
43

44 **While the above-mentioned changes in the 1970s marked the beginning of the**
45
46 **breakdown of the traditional demarcations in the financial sector, banking**
47
48 **theory, practice and regulation changes took place progressively into the 1980s.**
49
50 **The entry of foreign banks, removal of exchange controls in 1979 and retail**
51
52 **banks entering the mortgage market in the early 1980s, meant the UK banks**
53
54 **previously ring-fenced from competition bore the brunt of local and**
55
56 **international competition for loans and deposits (Llewellyn, 1990; Bowen et al,**
57
58
59
60

1999). This led to changes in bank funding mix and behaviour as the financial system became more market-oriented in the midst of a blurred demarcation between banks and other non-bank financial institutions. The period 1981-1996 was marked by low interest rates, this less favourable environment led to slow growth in lending as banks shifted from traditional lending to non-traditional activities.

Banking regulation was introduced to address the banking structural changes, specifically the side effects of increased competition and innovation (Hablutzel, 1992). The period between 1980 and 1994 saw major regulatory changes (Banking Act 1987 and Basel I and II). From 1996 to 2007, although deposits continued to grow, with a widened menu of available financial products and participation in open markets banks' reduced their dependency on loans as a source of income. However, the above mentioned regulatory changes seem to have had little effect on banks' source of funding as just before the crisis unfolded, UK banks' short-term wholesale finance peaked at more than a quarter of total funding (Dunkley, 2017) and bank balance sheets ballooned.

After the crisis banks responded to market and supervisory pressures (Basel III) to boost stable funding by significantly shifting their funding away from wholesale funding towards deposits. In general, lending was almost static from 2008-2012 as banks that had core deposit and equity capital continued to lend, whilst banks that held more illiquid assets on their balance sheets, in contrast, increased asset liquidity and reduced lending.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1.2.1 Other Liquidity Controls

The above discussed lending controls were not the only repressive tool used by the UK government; they were aided by other quantitative monetary tools such as liquidity requirement controls on banks which were meant to regulate the credit base. In this context as noted by Chadha and Corrado (2012) requirements to hold a higher fraction of reserves to deposits helps to constrain lending. While liquidity reserve requirements were in place, banks were required to hold government securities and this increased liquid assets in banks. However, this did not result in increased lending due to government control on lending.

Liquidity is fundamentally supposed to be banks’ internal business, however governmental and regulatory requirements override and forcefully takeover when the financial system is fragile, unstable and there is need to control money supply. This was the scenario during 1945-1970 and in the aftermath of the recent financial crisis when illiquidity threatened the global economy. In such periods, as discussed earlier, not only does LTD ceases to be an accurate measure of liquidity, but government authorities rush in with more prudential regulation to either suppress or free the economy.

1.3 Trend Analysis

The 1940-1970 was a period when British government was following more repressive policies to finance government debts, with bank regulation taking the form of cash and liquidity ratios (Goodhart, 2013). The British Government imposed qualitative and quantitative controls to restrict credit expansion. The impact of these policies and controls is reflected in Figures 1, 2 and 3. LTD ratio was under 20% after WWII, increasing to 44% in 1961 after which it slowly started to increase to 46% in 1971 eventually rising to 67 % in 1973 when the controls were less stringent as the government implemented ‘stop and go’ policies on credit control.

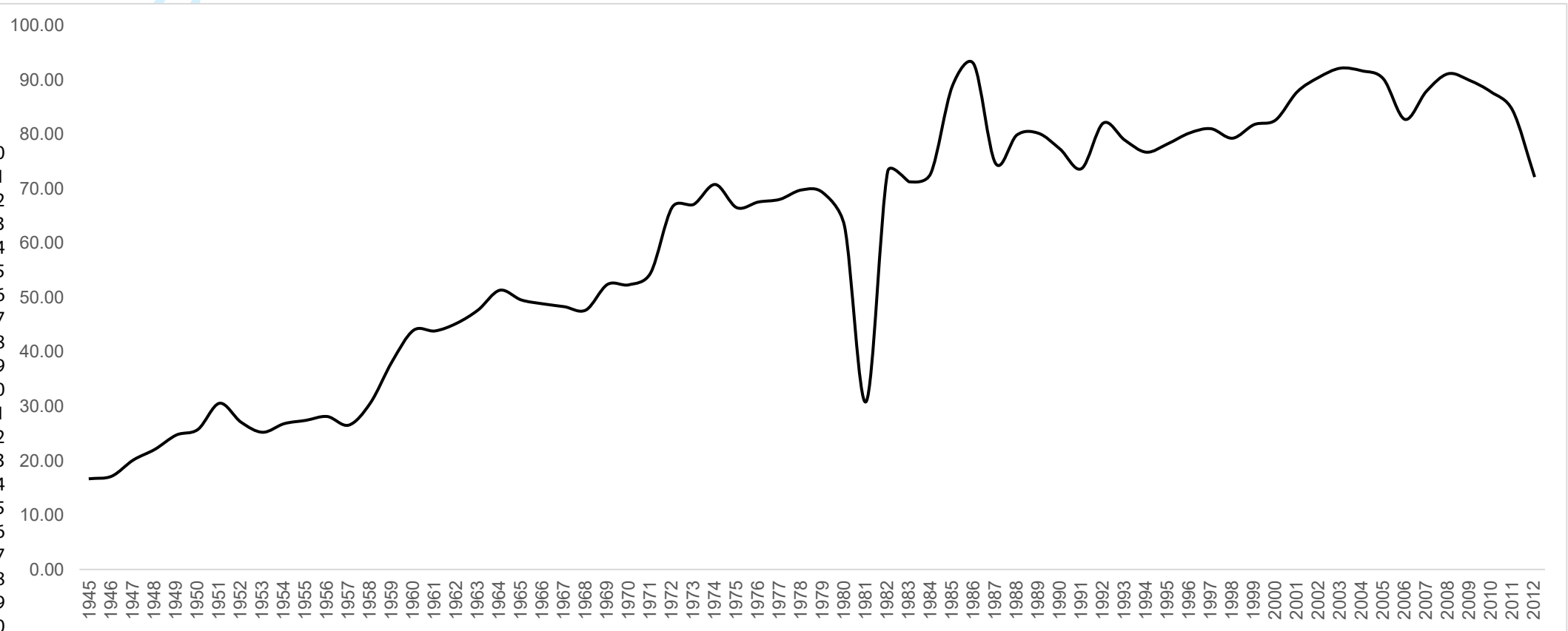


Figure 1 LTD Ratio from 1945-2012

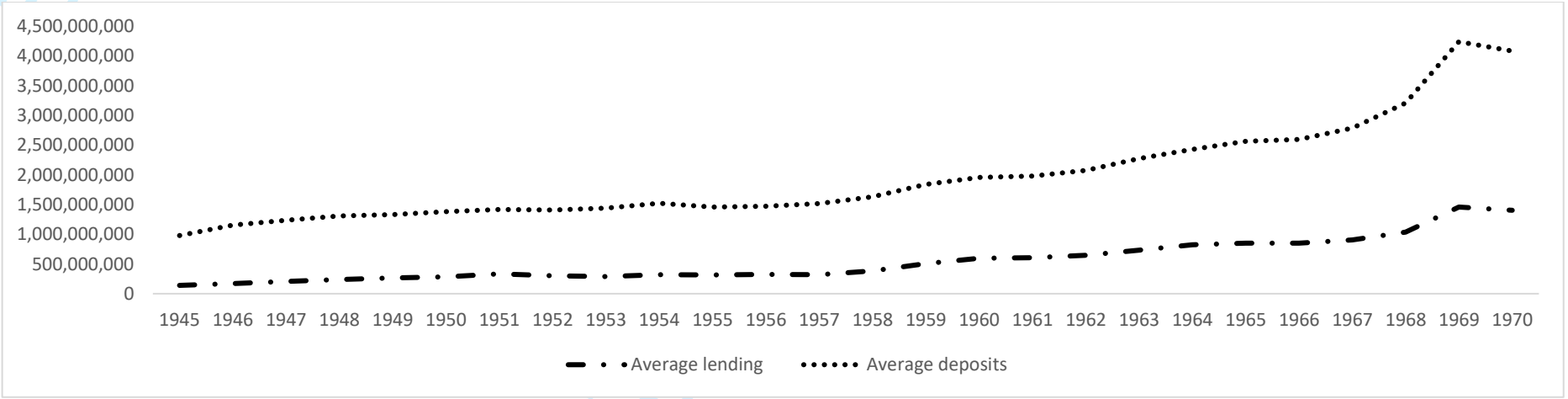


Figure 2 Average Lending and Average Deposits 1945-1970

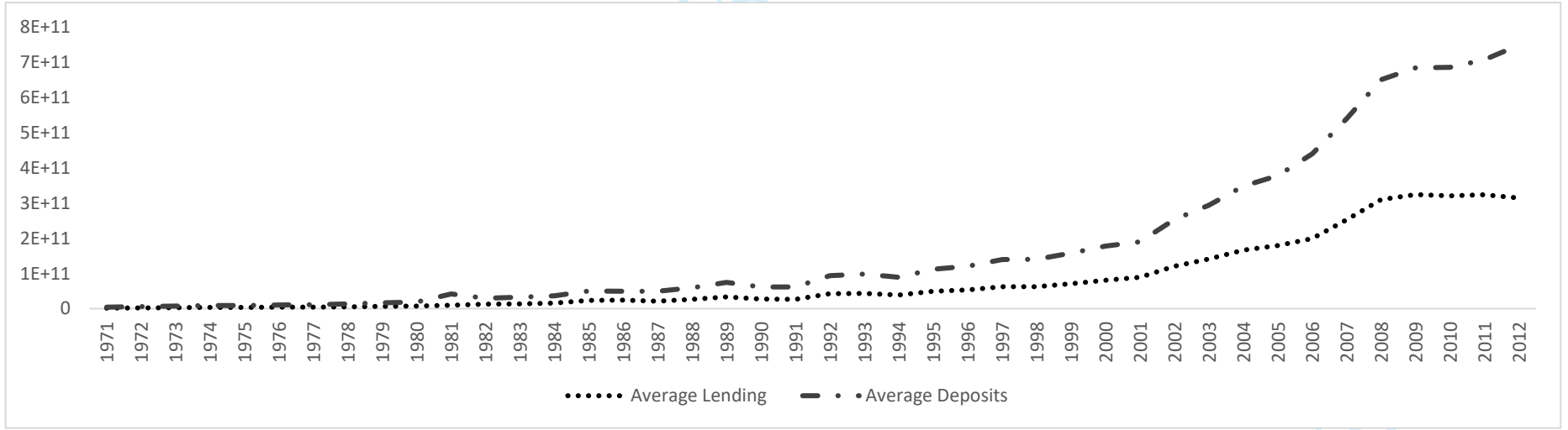


Figure 3 Average Lending and Average Deposits 1971-2012

The credit control part of CCC imposed restrictions on banks in the form of reserve ratio requirement which replaced the liquidity and cash ratio (Lewis, 1980; Brown, 1982). As shown in Figure 1, LTD was 52% in 1970, and in 1985, just before the Big-Bang it had significantly increased to 88%. The CCC also relaxed liquidity requirements and allowed banks to participate in wholesale market. The effect of banks moving into wholesale markets to fund loan advancement had the effect of increasing LTD to 92 % in 2003 remaining in the same range until 2005.

Since then, banks became 'financial supermarkets' offering a wide range of products and services thus extending beyond the traditional savings, payments and loans for retail and business banking. The variation in the nature and form of banking also changed the operations and consequently the composition of balance sheet as well as attitude towards profit. As banks' interest income remained relatively flat, they began to increasingly rely on non-traditional sources of income increasingly intensifying the wholesale markets dependent complex business models raising funds in the wholesale markets, instead of through retail deposits (Jaffar et al., 2014). These wholesale funds were used to lend more which ultimately pushed LTD ratio up. Because of the volatility and instability of financial markets, the issue of banks running into liquidity problems was no longer a question of if; it was evident in the trends during the 2008-2010 financial crisis as LTD ratio was 87% in 2007, falling to 84% in 2010 and eventually settling at 72% in 2012. The significantly high LTD ratios highlighted importance of liquidity and the central bank was forced to inject more liquidity into the banking system. When banks are mainly dependent on wholesale markets for funding loans, LTD increases as loans are increasing at a faster rate than deposit, however,

this negatively impacts bank stability and sustainability as wholesale funding is not guaranteed.

The decrease in LTD from 2008 onwards is reflective of increasing liquidity in banks as they deleveraged and reduced non-core funding (Jorda et al., 2021). This was also the period when more stringent liquidity requirements of Basel III; Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR) which focus on liquidity risk over a short-term horizon and structural liquidity mismatches were introduced. While LCR and NSFR consider stressed values of liquid assets and liabilities, LTD ratio is a ratio between the unweighted values of loans and deposits, and includes the intrinsic characteristics of loans and deposits, independent of contractual or assumed maturities.

1.4 Model Specifications

The LTD ratio depends on numerous internal and external factors including portfolio choices by households, banks and other non-financial institutions. Generally, the demand for and supply of deposits depend upon the returns which maximises the investor's utility function. From a portfolio theory perspective, agents base their decisions on the risk and returns characteristics of loans and deposits, relative to other assets and liabilities. In this context, it can be argued that high or low deposit rates influence depositors or investors decision to invest in other assets or save money in bank deposits.

Although Berg (2012) indicates that in a financial flow model deposits create loans and an increase in deposit in turn increases bank liquidity, the later argument only applies when it is not a closed system where loan growth is equal to deposit growth. This however, is not applicable in a situation where the activity side of banks is only limited to government bonds or lending and funding side is constrained by deposits. This was

the situation in UK after war, banks could not use alternative wholesale funding sources to fund their lending.

The LTD ratio comes from internal bank balance sheet management where the activity side (asset) of the balance sheet is completely dependent upon the funding side (Liability). In this case, banks face two constraints presented by Goodhart and Kashyap (2013) and Van den End (2016); potential use of funds (Retail Lending (L_r), Wholesale lending (L_w), and financial market assets (B)); and secondly the sources of funds (equity (E), Retail deposits (D_r), Wholesale deposits (D_w), Central Bank borrowing (CB) and securities issue (S)). Although these constraints work in modern competitive and innovative banking system, their application is limited in less competitive and controlled banking system witnessed in the UK before deregulation.

Equation 1 and 2 presents the above two constraints:

$$L_r + L_w + B \leq E + D_r + D_w + CB + S \quad (1)$$

$$L_r \leq D_r + (S + D_w) \quad (2)$$

These constraints relate to the fact that banks retail lending (L_r), wholesale lending (L_w) and other assets (B) should be less than the available funding sources which are retail deposits (D_r), wholesale deposits (D_w), central bank borrowing (CB) and securities issuance (S). Given this background, in the repressed banking system in UK from 1945-1970s, these constraints differ as limited access to wholesale funding and other assets and securities investment kept the banking system in a closed bracket of traditional banking. Thus in the context of UK banking system equation 1 and 2 become 3 and 4:

$$L_r + G_b \leq E + D_r \quad (3)$$

Where G_b is investment in government bills

$$L_r \leq D_r \quad (4)$$

From these four constraints, under normal competitive environment banks fund retail lending from both retail deposits and/or wholesale funding. However, the last two equations illustrate that the funding sources and other activities were limited in banking sector and, at a minimum when they were allowed to occur, and carried out by other non-banking financial institution. Hence banks were mainly involved in traditional banking of borrowing from surplus units and lending to deficit units along with some government bill investments. In this period the level of LTD depicts the severity of interest in banking sector to either maximise profit through sub-prime lending which increases LTD or by bringing funds from other wholesale funding sources and investing in other asset which decreases LTD and apparently lower liquidity risk is shown on balance sheet. Thus, the constraints are also linked to profit maximisation aspects;

Profit = Lending + liquidity + other assets - (retail deposits + whole sale borrowing + equity)

$$\min_{l, D_r, w, liq} \pi = L_{w,r} + liq + B - (D_r + D_w + E) \quad (5)$$

The above scenarios present two views. Firstly, the constraints lead banks towards more aggressive funding opportunities i.e. wholesale funding to increase the profit. Secondly, for better liquidity, LTD ratio should be at low level which is likely that the loans are below the equilibrium level and deposits are above the equilibrium level and opposite is true for high LTD. We therefore examine the effect of both activities and funding side of bank balance sheet items on LTD ratio:

Hypothesis 1. *Other assets on bank balance sheet are positively associated with loan to deposit ratio.*

Hypothesis 2. *LTD change is associated with other funding sources of banks.*

1.4.1 Data and LTD drivers

We use data from the annual reports and archives of Five Major British Banking Groups from 1945-2012, limiting the analysis to large banks for two reasons following Simonson et al.'s (1983) study. First, smaller banks do not have the capacity or market position to aggressively practice asset liabilities management and therefore, their balance sheet are not as likely to reflect differentiated policies relative to bearing interest rate risk. Secondly, MBBGs hold high value assets which aid in the robustness of analysis and reflection of the significant changes in UK banking system. For these large banks, deposit and loan data are taken in each year (t) along with the drivers of LTD for the period 1945-2012. Consolidated banking data have a broad coverage of loans and deposits however, based on Van den End's (2016) assertion, lack of detailed breakdown, and non-availability of historic loan data make consolidated statements less useful for the LTD ratio; hence individual bank data is also used. Although balance sheet elements have a distinct effect on the LTD ratio, there are some external uncontrollable factors which play a key role in altering LTD including interest rates and inflation. These elements have been controlled for in the empirical analysis.

We use Hodrick and Prescott (HP) (1980, 1997) filter for removing trend movements in balance sheet data; a filter that can be applied to both actual data (Kydland and Prescott, 1990; Backus and Kehoe, 1992; Danthine and Donaldson, 1993; Fiorito and

Kollintzas, 1994) and artificial data which is generated for a study to compare with actual data (Kydlan and Prescott, 1982; Cooley and Hansen, 1989).

1.5 Empirical analysis

Since 1945, the nature and operations of banks have seen significant changes particularly after deregulation and liberalisation in 1980s. The empirical approach is adopted to reflect these changes and to overcome the challenges that the data set present. As such, the data analysis is divided into two set of periods; pre-deregulation 1945-1980 and post deregulation from 1981-2012. **The time series is divided into two periods for two reasons; firstly to examine the changes in bank balance sheets in post war years when government restrictions dominated banking activity. Secondly, to examine bank balance sheets from the 1970s where increasing competition and deregulation emerge to significantly alter the trajectory of banking in the UK. Model (M1) below represents the changes in pre-deregulation period, M2 covers the post deregulation changes whereas, M3 is adopted to cover the changes in both periods to avoid non-uniform analysis. The third model also helps in capturing the deviation overall between the key variable and their means.**

The building societies and banking merger also changed the banks in the sample². Therefore, five major banks with highest total assets and market share are used pre and post deregulation. Further, the variables considered are susceptible to endogeneity, for example, banking merger in sample could influence the quantity of loan and deposits. To address endogeneity, a Hausman test (for the hypothesis that explanatory variables are strictly exogenous) is performed in order to formally test the

² From 1945 to 1969 National Provincial and Westminster banks are used, that merged in 1969 which changed sample by adding NatWest and RBS.

explanatory variables for endogeneity. An acceptance of null hypothesis that is 'there is no endogeneity' will lead to the suggestion that the explanatory variables in Equation (1) and (2) are not endogenously determined. The Hausman test rejects the null hypothesis at all conventional significance levels. Further, following Ashton et al.'s (2015) approach first difference is employed to all levels to estimate in Model 1, 2 and 3. The estimation of the systems of equations should be (i) asymptotically efficient due to non-restrictive assumptions about error autocorrelation and heteroscedasticity (Biørn and Klette 1999), (ii) accommodate the explanatory variables being jointly determined with the change in short-term deposit quantities, (iii) control possible relationships between the explanatory endogenous variables (Vergara, 2010; Hayo et al., 2010).

The model to be estimated are written as:

$$LTD_{1945-1980} = \beta_0 + \beta_1 Cash_t + \beta_2 Deposits_{(t-1)} + \beta_3 Loan_{(t-2)} + \beta_4 Other_{Assets_{(t-3)}} + \beta_5 Other_{Liabilities_{(t-4)}} + \varepsilon_t \quad (M1)$$

$$LTD_{1981-2012} = \beta_0 + \beta_1 Cash_t + \beta_2 Deposits_{(t-1)} + \beta_3 Loan_{(t-2)} + \beta_4 Other_{Assets_{(t-3)}} + \beta_5 Other_{Liabilities_{(t-4)}} + \varepsilon_t \quad (M2)$$

$$LTD_{1945-2012} = \beta_0 + \beta_1 Cash_t + \beta_2 Deposits_{(t-1)} + \beta_3 Loan_{(t-2)} + \beta_4 Other_{Assets_{(t-3)}} + \beta_5 Other_{Liabilities_{(t-4)}} + \varepsilon_t \quad (M3)$$

Where t-1 are lagged variables and ε_t error term. The fitted value of LTD changes from model (M1) and Model (M2), will be compared to model (M3) to understand the overall impact. The three models 1, 2 and 3 can be estimated as panel data model.

A test for first-order serial correlation is undertaken and is insignificant suggesting that the panel does not suffer from serial correlation. The selected data is also tested for unit root by employing Augmented Dickey fuller test (ADF).

Table 1 Dickey Fuller Test for Unit Root

ADF test for Unit root No. of Obs. 67			
Test Statistics	1% Critical Value	5% Critical Value	10% Critical Value
Z(t) -5.235	-3.563	-2.92	-2.595

The above test in Table 1 shows the test statistics value is greater than 5% critical value which rejects the Null hypothesis that the data has unit root or is non-stationary but accepts the alternative hypothesis that the data is stationary.

The Shapiro-Wilk W normality test is also undertaken to determine if the residual of the models are normally distributed, and the test imply that the empirical estimates obtained are not due to any outliers in the data.

Table 2 Test for Normality 1945-1970

Shapiro-Wilk W Test for Normal Data				
Variable	W	V	z	Prob>z
U	0.90452	1.935	1.311	0.09498

Table 3 Test for Normality 1971-2012

Shapiro-Wilk W Test for Normal Data				
Variable	W	V	z	Prob>z
U	0.96249	0.792	-0.464	0.67867

The results reported above shows $0.09498 > 0.05$ (the significance level) (Table 2, 1945-1970) and $0.67867 > 0.05$ (Table 3, 1971-2012) which indicate that the null

hypothesis of normal residual distribution is accepted. The above test indicates assumptions are met which enables the results of the regression model to be accepted.

1.6 Results

Descriptive statistics of the major banks' loans, deposits, other assets, other liabilities and LTD are presented in Table 4. The results from the three equation M1, M2 and M3 are presented in Table 5 and 6 for LTD for the entire period 1945-2012 and two time sets from 1945-1980 and 1981-2012.

Table 4 Descriptive statistics of loan, deposits, other liabilities, other assets, cash and LTD.

	1945-1980 (M1)					1981-2012 (M2)					1945-2012 (M3)				
	Loans	Deposits	Other Liabilities	Other Assets	LTD	Loans	Deposits	Other Liabilities	Other Assets	LTD	Loans	Deposits	Other Liabilities	Other Assets	LTD
Mean	1.460	2.630	0.87	4.99	44.20	1.24000	1.41000	9.7800	8.8300	83.93	5.9300	6.8000	4.6100	4.1800	62.90
Std. Dev.	2.000	2.720	0.68	2.67	18.64	1.42000	1.53000	2.19000	2.21000	12.71	1.15000	1.26000	1.58000	1.58000	25.57
Min.	1.09	5.06	0.04	0.002	13.49	2.620	3.540	0.23	8.800	58.28	1.09	5.06	0.04	0.002	13.49
Max.	1.1300	1.6000	0.35	1.510	81.37	5.92000	5.72000	1.270000	1.250000	118.86	5.92000	5.72000	1.270000	1.250000	118.86

Notes: Definition of variable and data sources is reported within the text in section 1.5. LTD is loan to deposit ratio, M1,M2 and M3 are Models covering different time periods. Number of observations: M1 (180), M2 (160) and M3 (340).Number of banks are five.

The descriptive statistics are considered overall to illustrate how variables have changed over time. Results show that while the number of banks considered remains constant over time, the level of other variables rise significantly. The standard deviations and means in Table 4 show significant differences in balance sheet structures among the five major banks over the period under consideration. Table 5 shows the correlation between these variables over the period in M1, M2 and M3 models.

Table 5 Correlation between variables

		Cash	Loan	Deposits	Other Liabilities	Other Assets	LTD
Cash	M1						
	M2						
	M3						
Loan	M1	0.9757*					
	M2	0.9729*					
	M3	0.9806*					
Deposits	M1	0.9755*	0.9849*				
	M2	1.0000*	0.9729*				
	M3	1.0000*	0.9807*				
Other Liabilities	M1	-0.1100	-0.0401	-0.0503			
	M2	0.8499*	0.8100*	0.8499*			
	M3	0.8443*	0.8168*	0.8450*			
Other Assets	M1	-0.3839*	-0.3593*	-0.2412*	0.0853		
	M2	0.7945*	0.7293*	0.7945*	0.9050*		
	M3	0.7893*	0.7410*	0.7899*	0.9127*		
LTD	M1	0.6252*	0.6809*	0.6035*	0.1603*	-0.5632*	
	M2	0.2885*	0.4551*	0.2885*	0.1224	0.0278	
	M3	0.5183*	0.5499*	0.5154*	0.2807*	0.2250*	

*denotes statistically significant at 10% significance. Model M1 is data from 1945-1980, M2 for 1981-2012 and M3 covering whole data set from 1945-2012.

Correlation between model variables are reported in Table 5. The strongest relationships are observed between loan and deposits. Significant positive correlation is also observed between the cash holding and loans, and deposits, and LTD. Other assets and liabilities however show negative correlation with most of the variables except for the correlation between other assets and other liabilities which is positive. Other assets on bank balance sheet are positively associated with LTD i.e. when other

assets increase LTD increases. For M1 from 1945-1980, when banking system was repressed, an increase in banks' investment in other assets reduced loans which resulted in decreasing LTD hence negative correlation of -0.5632. However, as banks were restricted from wholesale funding, other assets were also limited to government securities hence, the negative correlation. The positive correlation in M2 indicates that during deregulation access to wholesale funding in low interest rate environment provided extra room to lend all deposits and earn profit from other assets via borrowing from wholesale market. Therefore, an increase in other asset investments meant higher LTD holding other things constant.

Loans and deposits are highly correlated throughout the period. The correlation between loans and deposits in M1, M2 and M3 is 0.9849, 0.9729, and 0.9807 respectively. However, negative correlation of other liabilities with both loans and deposits illustrates that when banks deviate from their traditional role, the availability of other funding sources increase bank investment in other assets which is evident from high positive correlation between other liabilities and others assets in all three model (0.0853, 0.9050, 0.9127).

Loans, other liabilities and other assets in M1, cash and loans in M2, and cash, loans and deposits in M3 are statistically significant (Table 6). Loans and cash are significant in all estimations; none of the variables are insignificant in all cases.

Table 6 Model estimates: Loan to Deposit Ratio

	M1(1945-1980)	M2 (1981-2012)	M3 (1945-2012)
	LTD	LTD	LTD
Cash	-3.54e-09	-1.74e-10***	1.84e-08***
t^a statistics	(-1.71)	(-8.47)	(12.84)
p^b -values	(0.089)	(0.000)	(0.000)
Loans	1.73e-08***	2.35e-10***	2.24e-10***
t^a statistics	(4.26)	(11.42)	(4.73)
p^b -values	(0.000)	(0.000)	(0.000)
Other liabilities	4.09e-08**	-7.00e-12	-3.43e-11
t^a statistics	(2.66)	(-0.97)	(-1.96)
p^b -values	(0.009)	(0.332)	(0.051)
Deposit	-4.76e-09	0	-1.85e-08***
t^a statistics	(-1.20)	(.)	(-12.82)
p^a -values	(0.231)	(.)	(0.000)
Other assets	-2.03e-08**	-5.81e-12	-1.49e-11
t^a statistics	(-2.87)	(-0.90)	(-0.94)
p^b -values	(0.005)	(0.372)	(0.348)
_cons	43.68***	80.46***	67.62***
t^a statistics	(14.88)	(92.82)	(43.33)
p^b -values	(0.000)	(0.000)	(0.000)
N	144	128	272
R^2	0.663	0.611	0.623
$AR(1)$	0.0019	0.0001	0.0022

t^a Statistics in parentheses

p^b -values in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: $AR(1)$ is the first difference Levin-Lin-Chu unit-root test for unit root undertaken on all variables and displayed only for LTD variable for each model. This test is run on first difference data due to first difference transformation involved. The unit root test for null hypothesis of panel containing unit root is rejected at significance level 5%.

The positive coefficient between loans and LTD in all three models (Table 6) suggest that an increase in loans increases LTD level, however, the expansion of loans is partly financed by other funding sources, which increases the LTD ratio. The core funding source (deposits) show a negative coefficient suggesting that the decline in LTD is primarily driven by increasing deposits. Further, the negative coefficient between other assets and LTD explains the fact that if other assets are funded by deposits in times of economic downturn and low interest rate environment, LTD will increase since loans

remain constant but deposits increase as shown in Figure 2 and 3. One explanation for constant loans from the supply side is that in times of downturn, long term loans makes it hard for banks to adjust their loan book which makes loan book quite sticky.

While there is limited evidence to support hypothesis 2; LTD changes are associated with other funding sources. M1 strongly supports this hypothesis as increase in other liabilities increased LTD where other volatile funding sources are used to lend in good economic times' particularly high interest rate environments. These findings are in line with the findings of Van den End (2016). However, we differ from Van den End (2016) in that our focus is on UK MBBGs and the M2 negative coefficient disapproves the positive correlation between LTD and other liabilities as in M2 with increase in other liabilities there is a decrease in LTD. One explanation could be the fact that lower interest rate environment or downturn diverts bank's focus from long term, less liquid and low yield loans to short term, more liquid and higher yielding other assets.

1.7 Discussion and Conclusion

Findings of this study show that UK bank LTD ratios have undergone considerable change since 1945. LTD remains a significant feature in determining overall lending and investing decisions for a large number of banks. Lending controls and liquidity requirements in post war era restricted banks' lending, leading to lower LTD. However, the LTD trend shows considerable change in the period of transition where competition was encouraged and in the post-war period when LTD level in British banks increased from 16% to 92%. This increase in LTD level exposed banks to liquidity failures namely the 2000s crisis and 2007-2008 crisis.

Results of this study also show that LTD trend is also influenced by government policy measures, which influence market structures and financial intermediation. Trend analysis shows that the changes in LTD in UK banks were due to restricted lending and liquidity requirement by the government for the years 1945-1980s. During this period LTD was influenced by not only the above-mentioned government restrictions but also by macroeconomic factors inflation and interest rates. Consequently, up until 1970s, LTD only increased to 50% showing the relatively high liquidity level. A possible explanation for this level of LTD is the fact that banks mainly concentrated on their asset intermediation role (loans and deposits).

When government restrictions were lifted and bank liberalisation began, competition increased. These changes led to increased balance sheet size as banks were adding new funding sources such as wholesale funding and, in the process, moving from being predominantly asset transformers to financial supermarkets. The low interest rates also provided an opportunity for banks to shift from their traditional lending and borrowing role to generate higher returns through off-balance sheet activities. This consequently increased LTD from 50% in 1970 to 92% in 2008; a year in which the liquidity levels were lowest, indicating banks' dependence on other funding sources which are less stable and more volatile relative to deposits.

The earlier discussed association between loans, deposits, LTD, other assets and other liabilities has important bank practice, regulation, stability and policy implications. The 68- year long period of British banking was characterised by variations in not only operations but policies and regulations. Although Goodhart and Kashyap (2013) argues that no single regulatory tool is going to be sufficient to address the multiple sources of systemic risk, we support Le Leslé and Avramova (2012) and Bod'a and

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Zimkova (2021) who argue for the use of LTD as a tool for signalling indicator for liquidity problems at banks.

Further, in support of Van den End (2016), we suggest LTD ratio could be used by bank risk managers and micro-prudential supervisors to stimulate banks' preference for stable funding. More so when used in conjunction with quantity restrictions and fees on wholesale borrowing. Such restrictions combined with introducing national LTD limits may increase banks' preferences for retail deposits and help insulate core banking services and re-inforce ring fencing as illustrated in Figure 4.

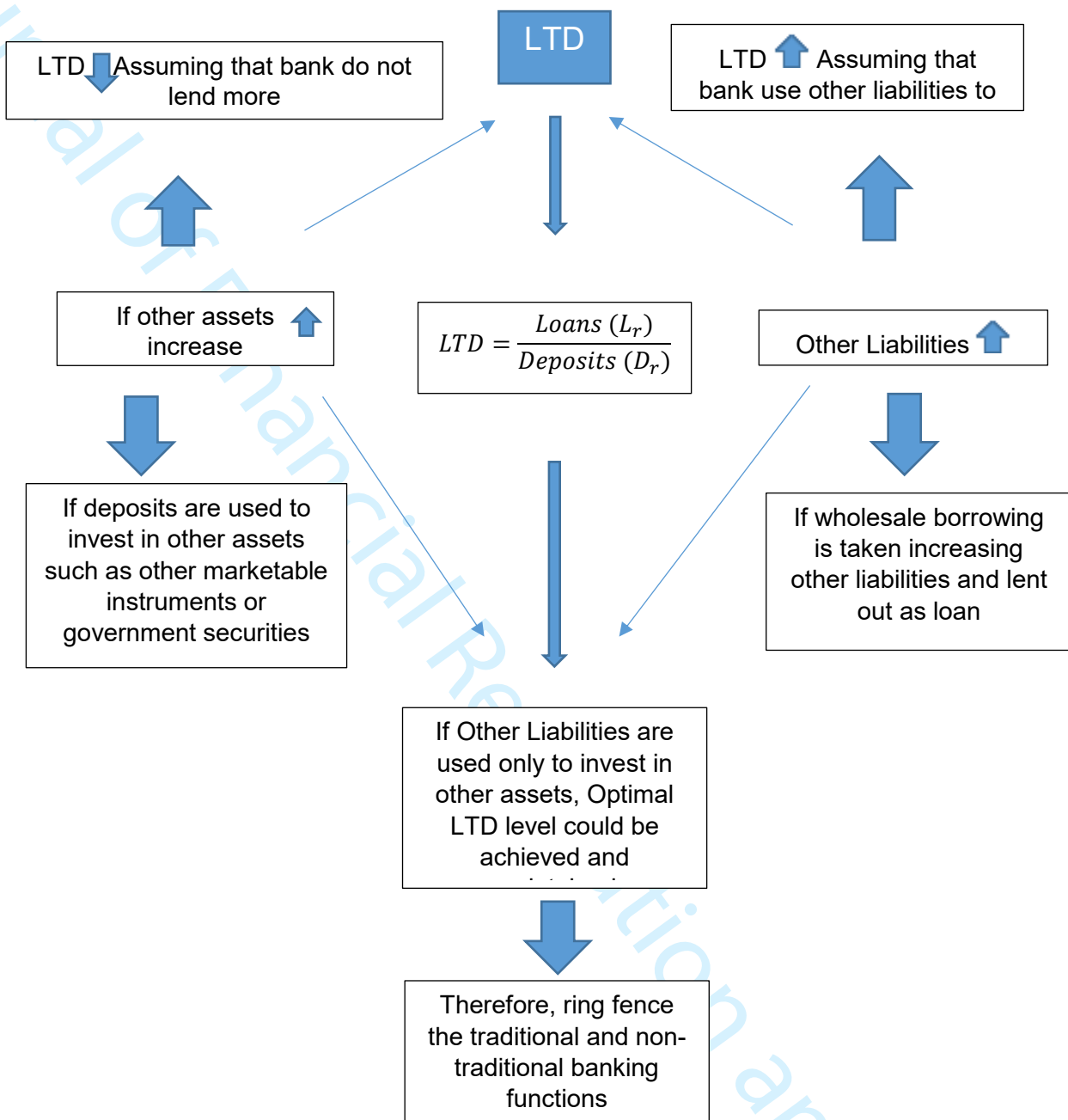


Figure 4 LTD drivers and their effects

In relation to the earlier discussed policies that have an effect on liquidity, Basel III capital liquidity requirement could also be considered modern day repressive policy. However, while the repressive policy of liquidity requirement of the 1940s mainly focuses on banks holding government securities, Basel III does not designate government securities as the only qualifying liquid asset (Reinhar, 2012). Basel III not only requires banks to hold liquid assets, but overall extends liquidity requirements

both in the short term and long-term. As highlighted by Van den End (2016), LTD ratio complements the liquidity ratios in the Basel III framework, the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR). While Basel III ratios focus on liquidity risk over a short-term horizon and structural liquidity mismatches at macro level, the LTD ratio is a ratio between the unweighted values of loans and deposits and could be useful at bank level (Goodhart, 2013).

Although the changes in regulation through Basel III may have led to some changes in liquidity, LTD ratio can be used as a micro prudential tool to address both structural (long-term) and cyclical (short-term) liquidity risks (Van de End, 2016). If used in combination with ring-fencing requirements, banks could be encouraged to target a long-term trend level of the ratio in which the banking sector functions soundly and does not face excessive funding risks or impaired intermediation. The crisis showed that this can pay off: economies where banks had relatively low LTD ratios weathered the crisis relatively well (Cecchetti et al., 2011).

While Basel III ratios form part of regulation and come with upper and lower limits, there is no international regulation that sets quantitative limits to the LTD ratio, mainly because the relationship between loans and deposits depends on the structure of the domestic financial system (Van den End, 2016). Since the financial crisis, the use of LTD ratios by regulatory authorities has increased significantly. **The US authorities set a lower bound to bank's state-wide LTD ratios (Federal Reserve Board, 2012) while Chinese regulators apply an upper limit of 75% for Chinese banks. In Europe LTD limits are regarded as national instrument that is subject to national rules and procedures (European Systemic Risk Board, 2014). The European Central bank imposes country-specific targets for banks' loan-to-deposit ratios and indicates that an LTD ratio over 120% is a presumptive indicator for a**

1
2
3 **banking crisis and an LTD of 80% is associated with impaired financial**
4 **intermediation (European Central Bank, 2012). Further, the European Banking**
5 **Authority (2019) makes use of risk traffic light heat map; green light for LTD ratio**
6 **below 100%, amber (moderate risk) for LTD value between 100% and 150% and**
7 **red (considerable risk) for LTD values greater than 150%.**
8
9

10
11
12
13
14
15 Alongside other indicators such as credit growth and non-core ratio, LTD is a strong
16 predictor of bank vulnerability and financial crisis (Borda et al., 2021). As the role that
17 LTD plays in financial stability policy continues to be recognised, there have been
18 improvements and proposal to make it more suited to the needs of macroprudential
19 regulation of financial systems. Bod'a and Zimkova (2020; 2021) proposes a financial
20 intermediation measure (FIM: a measure of attainment of financial intermediation) as
21 an amendment to the LTD ratio to compensate for the descriptive nature of the LTD
22 ratio. With the FIM adjustment, and judgement on upper bound, LTD becomes more
23 suited to, and useful for macroprudential regulation. Adopting the upper bound
24 threshold value of 150% applied in European banks Bod'a and Zimkova (2021)
25 amends the LTD using the FIM to allow for distinguishing between situation when the
26 potential of financial intermediation is underutilised, and the LTD ratio might be more
27 safely higher and a situation when the accomplishment in financial intermediation is
28 overly risky and the LTD ratio with a high value signal too high a level of liquidity risk.
29 Although judgment is still required in setting the upper limit for the LTD ratio, above
30 which any value is indicative of increased riskiness, adding a normative indicator
31 strengthens the LTD ratio the enhances and justifies its usefulness for macroprudential
32 regulation.
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55

56 No single tool is likely to be sufficient to contain the problems arising during a crisis,
57 however, with amendments such as the financial intermediation measure enhancing
58
59
60

the LTD ratio with signalling effects (Bod'a and Zimkova, 2021) the LTD ratio has become useful a liquidity measurement tool to complement the liquidity ratios in the Basel III framework, more so if voluntarily embraced on a bank level as opposed to being imposed as another regulatory tool. An optimal LTD level can help to restrict wholesale funded credit expansion which not only lead to liquidity risk, but mismatch in maturity creating liquidity drainage in an economic downturn or even leading to one. Values for optimal LTD boundaries may be difficult to specify as boundaries may vary bank by bank (depending on the business model) and from one country to another; however, it is possible to set estimated values for banks with similar operations and size. As such, the UK following Europe, China and US could set LTD boundaries as reference points for policy measures and as reflected in ring-fencing requirements, guidance or incentives to change banks' business models towards more traditional, deposit-based lending could improve the sustainability of banks' financing model.

1.8 Limitations and Further research

The 68-year time period selected was a time within which accounting and reporting standards were continuously changing. Due to these changes, some of the figures were altered which may have implications on results. An HP filter was used to ensure that like variables were compared and precautionary measures were taken while interpreting the data.

This study focuses on major British banks but the development of a 'Big Five' and then a 'Big Four' changed the character and indeed the existence of certain banks. This changed the sample in pre- and post-deregulation periods. Effort has been made to select the banks efficiently after a merger so that the 'same bank' is reflected in the numbers and also that the criteria for choosing major banks were met.

Potential areas for future research can include banks from other international banking markets in the sample to investigate the volatility spillovers across

1
2
3 traditional and non-traditional banking and its effect on bank liquidity and
4 stability. It has been 9 years since Basel III, further research could cover the
5 period from the 2008 financial crisis to examine the LTD trends when UK banks
6 are responding to and complying with 'the modern day repressive tools' i.e.
7
8
9
10 **Basel III.**
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

References

- Acharya, V.V. and Mora, N., 2015 A crisis of banks as liquidity providers. *The journal of Finance*, 70(1), pp.1-43.
- Backus, D. K., and Kehoe, P. J., 1992 International Evidence on the Historical Properties of Business Cycles, *American Economic Review*, 82:4 (1992), 864–888.
- Berg, S.A. 2012 The declining deposit to loan ratio - What can the banks do?, Staff memo 28/2012, Norges Bank.
- Biørn, E. and Klette, T.J., 1999. The Labour Input Response to Permanent Changes in Output: An Errors-in-Variables Analysis Based on Panel Data. *Scandinavian Journal of Economics*, 101(3), pp.379-404.
- Bowen, A., Hoggarth, G. and Pain, D., 1999 The recent revolution of the UK banking industry and some implications for financial stability. The monetary and regulatory implications of changes in the banking industry, 7, pp.251-94.
- Bod'a, M., & Zimková, E. 2020 A DEA model for measuring financial intermediation. *Economic Change and Restructuring*, 54(2), 339–370.**
- Bod'a, M. and Zimková, E., 2021 Overcoming the loan-to-deposit ratio by a financial intermediation measure—A perspective instrument of financial stability policy. *Journal of Policy Modeling*.**
- Brown, A. J., 1982 Accelerating inflation and the growth of productivity, is slower growth in the western world, ed, RCO,
- Chang, C.P. and Lin, J.H., 2010 Bank liquidity providing in a real synergy management under a cap-based valuation. *Applied Economics*, 42(24), pp.3161-3173.
- Cecchetti, S.G., King, M.R. and Yetman, J., 2011 Weathering the financial crisis: good policy or good luck? BIS Working Papers, 351.

Chadha, J.S. and Corrado, L., 2012 Macro-prudential policy on liquidity: What does a DSGE model tell us? *Journal of Economics and Business*, 64(1), pp.37-62.

Cooley, T.F. and Hansen, G.D., 1989 The inflation tax in a real business cycle model. *The American Economic Review*, pp.733-748.

Cox, D.R. and Lewis, P.A.W.L., 1966 The statistical analysis of series of events.

Danthine, J., P., and Donaldson, B. J., 1993 Methodological and Empirical Issues in Real Business Cycle Theory, *European Economic Review* 37:1 1–35.

Diamond, D.W., 1984 Financial intermediation and delegated monitoring, *Review of Economic Studies* 51, 393-414.

DiSalvo J. Johnston R., 2017. Banking trends: the rise in loan-to-deposit ratios: is 80 the new 60? Federal Reserve Bank of Philadelphia, 2017. [https://www.philadelphiafed.org/research-and-data/ banking](https://www.philadelphiafed.org/research-and-data/banking). Accessed 23 September 2021

European Banking Authority 2017 Risk assessment report—November 2017.
<https://www.eba.europa.eu/sites/default/documents/files/documents/10180/2037825/4f9778cc-1ccd-4f65-9bc3-eb76971b9a4a/Risk%20Assessment%20Report%20-%20November%202017.pdf?retry=1>. Accessed 13 October 2021

European Banking Authority 2019 Risk Dashboard Data as of Q1. 2019. Regular risk assessment report, 4 July 2019, European Banking Authority, Paris.

European Central Bank 2012. Financial Stability Review. June.

<https://www.ecb.europa.eu/pub/pdf/other/financial>

stabilityreview201206en.pdf??04dd3f34bbcd698b66591b5d95ea6b3 (Accessed 22 October 2018)

Dunkley, E. 2017 Ten years after Northern Rock: has UK banking changed?', Financial Times , 13 September , Available at: <https://www.ft.com/content/d05c3ea4-97bf-11e7-a652-cde3f882dd7b> (Accessed: 04 November 2021).

European Systemic Risk Board. 2014 The ESRB Handbook on Operationalising Macroprudential Policy in the Banking Sector. March 2014, European Systemic Risk Board, Frankfurt am Main.

Elliot, D. J., 2011 The Brookings Institution Available at <https://www.brookings.edu/wp-content/uploads/2016/06/13-governance-issues-macroprudential-policy-elliott.pdf> (Accessed 10 June 2019)

Federal Reserve Board 2012 Banking Agencies Issue Host State Loan-to-Deposit Ratios, Press release, June 29, 2012.

Fiorito, R., and Kollintzas, T., 1994 Stylized Facts of Business Cycles in the G7 from a Real Business Cycles Perspective, *European Economic Review*, 38:2 235–269

Gatev, E., Schuermann, T., & Strahan, P. E., 2009 Managing bank liquidity risk: How deposit-loan synergies vary with market conditions. *Review of Financial studies*, 22(3), 995-1020.

Goodhart, C. A. E., 2014 Competition and Credit Control (No. sp229). Financial Markets Group.

Goodhart, C.A., Kashyap, A.K., Tsomocos, D.P. and Vardoulakis, A.P., 2018 An integrated framework for analyzing multiple financial regulations. *29th issue (January 2013) of the International Journal of Central Banking*.

Gowland, D. H. 2013 Controlling the Money Supply (Routledge Revivals). Routledge.

Grady, J. and Weale, M. 1986 British Banking 1960-85, 1st ed., McMillan Press LTD: Hong Kong.

Hayo, B., Kutan, A.M. and Neuenkirch, M., 2010 The impact of US central bank communication on European and pacific equity markets. *Economics Letters*, 108(2), pp.172-174.

Hodrick, R., J. and EC Prescott, 1980 Postwar US business cycles: an empirical investigation. Discussion paper 451, Carnegie Mellon University.

Hodrick, R.J. and Prescott, E.C., 1997 Postwar US business cycles: an empirical investigation. *Journal of Money, credit, and Banking*, pp.1-16.

Jaffar, K., Mabwe, K. and Webb, R., 2014 Changing Bank Income Structure: Evidence from Large UK Banks? *Asian Journal of Finance & Accounting*, 6(2), pp.195-215.

Jordà, Ò, Richter, B., Shularick, M., & Taylor, A. M., 2021 Bank capital redux: Solvency, liquidity, and crisis. *The Review of Economic Studies*, 88(1), 260–286.

Kashyap, A.K., Rajan, R. and Stein, J.C., 2002 Banks as liquidity providers: An explanation for the coexistence of lending and deposit-taking. *The Journal of Finance*, 57(1), pp.33-73.

Kydland, F., E., and Prescott, C., E., 1982 Time to Build and Aggregate Fluctuations, *Econometrica*, 50:6 (1982), 1345–1370.

Le Leslé, V. and Avramova, S., 2012 Revisiting Risk-Weighted Assets, International Monetary Fund, Available at: <https://www.imf.org/external/pubs/ft/wp/2012/wp1290.pdf>

Lewis, W. A., 1980 The slowing down of the engine of growth. *The American Economic Review*, 555-564.

Llewellyn, D., T., 1990 "Competition and Structural Change in the British Financial System", in E. P. Gardener (ed.) *The Future of Financial Systems and Services*.

Lowe, P. and Stevens, G., 2006 Procyclical Financial Behavior: What Can Be Done? In Procyclicality of Financial Systems in Asia (pp. 137-160). Palgrave Macmillan, London.

Lowe, P., 2002 Credit risk measurement and procyclicality.

McKinnon, R.I. and Mathieson, D., 1981 How to manage a repressed economy, Princeton Essays in International Finance, No. 145 (Princeton University Press, Princeton, NJ).

Office of the Comptroller of the Currency 2016 Prohibition against interstate deposit production. Description: annual host state loan-to-deposit ratios. OCC Bulletin 2016-40. U.S. Department of the Treasury, 2016. <https://www.occ.gov/news-issuances/bulletins/2016/bulletin-2016-40.html>. Accessed 06October 2021

Partington, I., 1987 Applied economics in banking and finance, 4th ed., New York: oxford university press.

Reinhart, M., C., 2012 The return of financial repression, Financial Stability Review, No. 16.

Roubini, N., & Sala-i-Martin, X. 1992 Financial repression and economic growth, Journal of development economics, 39(1), 5-30.

Satria, D.M., Harun, C.A. and Taruna, A. A., 2016 The Macro-prudential aspects of loan-to-deposit-ratio-linked reserve requirement. Applied Economics, 48(1), pp.24-34.

Simonson, D.G., Stowe, J.D. and Watson, C.J., 1983 A canonical correlation analysis of commercial bank asset/liability structures. Journal of Financial and Quantitative Analysis, 18(1), pp.125-140.

Stowe, J.D., Watson, C.J. and Robertson, T.D., 1980 Relationships between the two sides of the balance sheet: A canonical correlation analysis. The Journal of Finance, 35(4), pp.973-980.

1
2
3 Van den End, J.W., 2016 A macroprudential approach to address liquidity risk with the
4 loan-to-deposit ratio. The European Journal of Finance, 22(3), pp.237-253.
5

6
7 Vergara, R., 2010 Taxation and private investment: Evidence for Chile. Applied
8 Economics, 42:717-725.
9

10
11 Vinals, J., 2011. Macroprudential policy: an organizing framework. IMF Paper.
12

13
14 Woodford, M., 1998 Control of the public debt: a requirement for price stability? In The
15 Debt Burden and Its Consequences for Monetary Policy (pp. 117-158). Palgrave
16 Macmillan, London.
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Reviewer: 1

Dear Reviewer,

Thank you for carefully reading the paper and for your comments and helpful suggestions. Based on your recommendations, we have made the following revisions to the manuscript. Please find below the answers (in italics) to your remarks (copied in bold)
We have also highlighted changes made in the revised manuscript in bold font

Questions:

1. Originality: Does the paper contain new and significant information adequate to justify publication?: The paper examines the liquidity position of UK banks across a long period (1945-2012)I think the topic is quite interesting presenting a certain level of originality (especially linked to the long period considered, characterized by strong differences for banking)

Our Response: Thank you for the above comment

2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored? Literature is quite adequate

Our Response: Thank you for the above comment

3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate? I think the paper is not so focused on the purpose it seems to have. That is, I find the paper (especially up to the 1.3 paragraph) to much descriptive and a little vague).

Our Response: Thank you for the above comment. The introductory part of the paper aims to contextualise and provide a background to the bank balance sheet and LTD. We acknowledge that this may be common knowledge to the readers. We have addressed this by taking away some of the unnecessarily descriptive comments and amended the last section of the introductory part to illustrate the focus and the purpose of the paper (see page 3).

It is not clear the decision of analysing so many years during which the financial system and the banking in particularly have radically changed.

Our Response: Thank you for the above comment. The period was chosen to illustrate the significant LTD fluctuations consequent of the varying government controls throughout the repressive and non-repressive periods. We believe a different or a shorter period may not achieve the desired purpose as the study aims to present a historical view from 1945, which was the period after the War through to the 2008 financial crises and the period immediately after. Therefore, the study captures two periods where banks were under government control but for different reasons with implications for loans, deposits. An explanation as to how the periods are divided has been added (see page 15).

The authors introduce Basel 3 liquidity measures but they do not link them appropriately to the aim of the paper

Our Response: Thank you for the above comment. We have now made a better connection by moving Basel III from the introductory part of the paper to the discussion and conclusion section. We have also discussed and highlighted the similarities and differences between LTD and Basel III and in the process demonstrated the usefulness of LTD at banks level as a complement to Basel III. As the paper covers a 68-year long period of how government and regulatory controls affected LTD ratio, we believe the movement of content and the new linkages re-focuses the discussion of Basel III to the aim of the paper as Basel III can be regarded as a banking 'modern repressive tool' (see pages 27-28).

4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: They are presented quite clearly

Our Response: Thank you for the above comment.

5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

paper?: Implications are practically absent. The authors must stress this aspect, adding implications for banks management, authorities. I think they have also do add limitations of the paper and why not the ideas for further research

Our Response: Thank you for the above comment. We have addressed your comment by adding a discussion on the use of LTD in combination with restrictions on wholesale funding and national LTD limits as a reinforcement for ring-fencing rules, which came into force in 2019. Should the UK want to adopt LTD as a regulatory standard, our paper have contributed to literature by highlighting the use of and standard setting of LTD limits in other countries (see page 25). Future research and limitations have been added (see pages 29-30).

6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the fields and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: The quality is fine (I am not an English native)

Thank you for the above comment.

Reviewer: 2

Dear Reviewer,

Thank you for carefully reading the paper and for your comments and helpful suggestions. Based on your recommendations, we have made the following revisions to the manuscript. Please find below the answers (in italics) to your remarks (copied in bold)

We have also highlighted changes made in the revised manuscript in bold font

Reviewer Comment 1

1. Originality: Does the paper contain new and significant information adequate to justify publication?: The paper brings significant information to the scientific field. It especially reveals the impact of changing severity of government controls on LTD ratio for the period 1945-2012 for Major British Banking Group (MBBGs): HSBC, Lloyds Banking Group, Royal Bank of Scotland Group (p. 3). The author justifies importance of LTD for micro and macro prudential policies and recommends LTD ratio as complement to the liquidity ratios in the Basel III framework, the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR).

Our Response: Thank you for the above comment

Reviewer Comment 2

2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: The literature cited in the text contains the most widely cited and respected academic journals on finance, however it ends in 2016 (van den End, 2016, which is dated erroneously to 2014), and there is a gap of 5 years of academic or central banking literature. Nonetheless, there has been vivid developments since, and these are ignored.

Interestingly, Bod'a & Zimkova (2020, 2021) have similar ideas to employ the LTD as both a liquidity measure and a tool of macroprudential supervision, and there are some other papers that are focused upon the usefulness on the LTD (Jorda et al 2021). In addition, the ECB employs the LTD as well in monitoring the banking system and its

resilience (e.g. European Banking Authority, 2019; European Systemic Risk Board, 2014).

Our Response: Thank you for the above comment we acknowledge your suggestions. We have addressed your comment by expanding the literature review and incorporating LTD ideas and developments from the above-mentioned literature sources to cover the 5-year gap (see pages 3,5-6).

Reference to Van den End (2016) has been corrected.

The text only refers to the ECB (2012), but in a somewhat uncertain manner, as if in European banking the LTD was only discussed as a potential policy instrument. Yet, since then, the situation has changed.

Our Response: Thank you for your comment. We have expanded the discussion on how the ECB employs the LTD in monitoring the banking system. Further, we have incorporated the increased use of LTD and limit setting in Europe by the European Banking Authority, and European Systemic Risk Board (see pages 27-28).

Reviewer Comment 3

3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: In the text trend analysis and panel regression is used. A gap of data after 2012 is unexplained. I tis necessary to add data for the five major UK banking groups after 2012 until present and to redo the analysis (or provide an explanation).

Our Response: Thank you for the above comment. The paper is part of a large research whose data was collected and analysed up to 2012. The data included in our sample covers the immediate impact of banks' response to Basel III. Further research could cover 2012 onwards to capture LTD trends when UK banks are responding to and complying with 'the modern day repressive tools' i.e. Basel III (see pages 29-30).

The description for the period between 1945 until the 2010s is with „blackouts“. Subsection 1.2 covers the development between 1945 and the 1970s, and there is a sudden and unreasoned jump to Basel III.

Our Response: Thank you for the above comment. Following on your comment, we have removed Basel III from the introductory part of the paper to the discussion and conclusion section. We have also expanded the discussion of government policies and the knock-on effect on bank loans and deposit for the period 1979 to 2012 to cover the 'blackout' (see pages 5-6).

The models to be estimated presented on page 14 and labelled as (M1) to (M3) are not presented correctly. There are glaring mistakes in the subscripts and the time delays. Since there is no difference between the models employed with the three data samples, one model should be given with LTD(t) as the explained variable. The time lags at Cash, Deposits, Loan(s), Ohter_Assets and Other_Liabilities, t to t – 4, are obviously wrong.

When descriptive statistics are presented, e+09, e+10, e+11 etc. formatting should be avoided.

Our Response: Thank you for your comment. We take this comment on board and have formatted and presented the descriptive statistics table as suggested (see page 19). We have also corrected the models (see page 15). The justification for employing three models is clarified on page 16.

Reviewer Comment 4

4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: In conclusions there is a statement that „the UK following China and US could set LTD boundaries as reference points for policy measures...“. The ECB could be included too.

Our Response: Thank you for the above comment. We have added European Central Bank (see Pages 27-28).

Reviewer Comment 5

5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: The paper provides relevant arguments why and how the LTD ratio can be used in micro and macro prudential regulation.

Our Response: Thank you for the above comment.

Reviewer Comment 6

6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the fields and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: Author's writing style is relevant as to jargon use, acronyms etc., however cited works are presented carelessly and with mistakes.

Our Response: Thank you for the above comment. Following this comment, we have rechecked and corrected the references.