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HOW REGULATION OF BANK CAPITAL ADEQUACY AND LIQUIDITY AFFECTS PRICING OF BONDS OF THE BANKS

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Abstract. The article discusses the evolution of regulation of banks in Kazakhstan before and after financial crisis of 2007-2008. The purpose of the article is to examine how introduction of Basel III standards on capital adequacy and liquidity affected pricing of bonds of Kazakh banks. In general, post crisis reforms in the banking system, mainly Basel III standards, enhanced capital adequacy and liquidity of the banks. Banks now tend to hold more capital and high-quality liquid assets compared to pre-crisis period. Our analysis showed that banks with better liquidity conditions would receive cheaper funding via bonds compared to other banks. We found that bond prices reacted explicitly to the changes in liquidity requirements, rather than capital measures. New capital adequacy measures seem to be less constraining for banks with government support. In contrast, changes in capital measures made substantial impact on bond spreads of banks without government support, these banks actively increased their capital in post crisis period.

Keywords: capital adequacy; liquidity; crisis; risks; pricing

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JEL Classifications: G10, G12

1. Introduction

The financial world has changed irrevocably since global financial crisis of 2007-2008. In response to the crisis, central banks in many countries across the globe introduced Basel III standards aimed at improving the quality of banks' capital and adding countercyclical and conservational buffers (Basel Committee on Banking Supervision, 2018). The Basel III standards also focused on liquidity coverage and stable funding issues in light of the problems with tight liquidity and overreliance on short term funding.

This article examines how implementation of Basel III standards on capital adequacy and liquidity affected the perceived risk of banks in Kazakhstan via pricing of their bonds. Consistent with other research, banks with superior liquidity would receive cheaper funding through bonds compared to other banks. Bond spreads captured changes in liquidity measures better than capital adequacy measures. Additionally, we split the sample banks into

two groups based on their implicit government support and examined how Basel III standards affected each group. Finally, we add the results obtained to existing theoretical literature on asset pricing and financial stability.

2. Literature Review

The global financial crisis of 2007-2009 started as a subprime mortgage crisis in the USA, had dramatic negative consequences for global economies. Many economists compare the crisis with a Great Depression both in scope and depth. However, according to Gorton and Metrick (2012), its novelty relates to the financial crisis taking place in “shadow” banking sector. Securitization, money market, mutual funds and repurchase agreements are among specific features of the new crisis. Gorton (2018) noted that all countries with market economies are still vulnerable to global crises due to massive short-term debt and potential maturity mismatch.

N. Frank and H. Hesse (2009) argue that financial contagion hit EM countries, with further spillover to the real sector resulting in export and GDP growth rates fall as well as decrease in global trade finance. Cetorelli and Goldberg (2011) found that a contraction in cross-border lending by foreign banks had a substantial impact on lending from developed markets to emerging markets. Kazakhstan was not an exception. According to IMF survey of Kazakhstan (IMF, 2010), the oil rich country enjoyed stable foreign investments with annual GDP growth at 10% during 2000-2007. Kazakh banks made massive borrowings from foreign banks to finance construction and real estate. With onset of the global financial crisis the capital inflows into Kazakhstan run short, which negatively affected credit growth and collapsed asset prices. The banking sector experienced serious problems due to slowdown of economy and large credit exposure in foreign currency. Some local banks had to restructure their external debts, and the number of nonperforming loans increased. Besides, Kazakh banks were forced to raise interest rates on their loans and tightened up lending conditions, which in turn reflected in shrinking of lending to local economy (Annual Report of the National Bank of Kazakhstan for 2008).

Another big issue with global financial crisis relates to poor liquidity risk management across many developed and developing economies. Basel Committee on banking supervision noted that many banks failed to have sound liquidity risk management framework with misaligned business incentives and risk tolerance (Basel Committee on Banking Supervision, 2008).

In response to the crisis regulators across the world took a range of measures such as injection of liquidity, recapitalization of banks, interest rates cuts etc. In Kazakhstan the government among other measures recapitalized four systemic banks as they run out of liquidity and failed to roll over their debts in foreign currency (Resolution of the Government of the Republic of Kazakhstan, 2008).

Another popular form of policy response to financial crisis was implicit government guarantees of bank debts. According to Schich and Lindh (2012) the guarantees are associated with the banks that are ‘too big to fail’. The authors claim that (value of) implicit guarantee is costly for the banks with low creditworthiness, besides it depends on ‘creditworthiness of its government and the size of the bank’. Schich and Aydin (2014) argue that the value of implicit bank debt guarantees is huge. They found that in absolute terms, preliminary funding cost advantages may reach USD 10 billion annually for banking sectors in some countries and may amount to 1% of domestic GDP or 3% in crisis situations. Tsesmelidakis and Merton (2015) studied the cost of implicit guarantee and found that too-big-to-fail banks purposefully took advantage of their new privilege and switched to short-term bonds as compared to non-guaranteed banks that prefer long-term debt in the time of financial distress.

However, Correa, Lee, Sapriza and Suarez (2012) argue that banks that plan to receive government support tend to have negative excess returns after sovereign rating downgrades, in particular in the developed economies.

The crisis of 2007-2009 has been thoroughly examined from different angles, including the role of liquidity and leverage in magnifying the crisis. For instance, Adrian, Boyarchenko, and Shin (2015) analyzed impact of book equity in lending decisions of the banks and how they realign balance sheets in the short and long terms. They found out that the way banks manage their capital and liquidity amplifies financial distress. Pierret (2015) in her work examines an interaction between solvency and liquidity risks of banks. She revealed that banks are denied access to short-term liquidity when they are expected to be insolvent in times of distress, so called 'solvency-liquidity nexus'. Pierret argued that among other things, capital helps to make creditors confident to provide funding to the banks in financial distress. Sheng-Hung Chen (2013) argues that bank regulation of capital and competition significantly enforce productivity (and profitability) of the bank, and close supervision is associated with higher bank productivity.

The efficient markets hypothesis states that efficient market asset prices fully reflect all information argued Fama (1969). Changes in regulation of capital adequacy and liquidity of the banks led to adjustments of banks' balance sheet. Market reacted to these changes by charging premiums or discounts to securities issued by the banks. Besides, Morgan and Stiroh (2000) and Jagtiani, Kaufman and Lemieux (2002) studied relationship between a bank's risk profile and funding costs, the found that debt spreads reflect financial condition of the issuing bank. In our paper, we examine the impact of the regulatory changes of Basel III standards on banks' perceived risks via bond debt spreads.

3. Pre-crisis problems in Regulation

Prior to crisis the macroeconomic situation in Kazakhstan was quite favorable. The international economy and trade demonstrated stable growth. The prices for oil, metals and wheat grain – Kazakhstan's main export items were high. The GDP of Kazakhstan was growing at around 10% per annum in 2005-2007. Foreign debt of the government in January 2006 was low at 2,5% of GDP. These indicators supported a steady inflow of foreign currency leading to a stable exchange rate.

Real estate prices were rising rapidly indicating a boom. In 2007 they peaked at levels of 500-1000% to prices of 2001. Between 2005 and 2007 the construction sector was increasing at the average rate of 37% (Financial Stability Report of Kazakhstan 2007).

The financial sector was dominated by banks. In 2007 the banking sector consisted of 34 banks with 5 banks concentrating around 78% of total assets. Banking loans in Kazakhstan were growing at annual rate of 58% during 2002-2006 and reached +86% by September 2007. In the same period loans-to-GDP ratio rose from 20% to 60%. A significant part of that growth was attributed to the growth in the real estate sector. Profitability was high, as of October 2006 ROA reached 2.3% and ROE – at 23.9%.

Banks were enjoying high credit ratings and this allowed them to access foreign capital markets to fund the credit growth. By 2008 the level of foreign debt of banks reached 50%.

The Financial Supervision Agency of the Republic of Kazakhstan introduced Basel I capital requirements in early 2000s. The ratios were higher than recommended by the Basel Committee, reflecting higher credit risk of the country.

As defined in Financial Stability Report of Kazakhstan (2007), the regulator introduced new requirements on credit provisioning in April 2007 as a result of:

a) Prices for real estate were growing at very high rate and the collateral was overvalued. The new requirements placed more focus on the client's financial situation, especially for real estate mortgages;

b) Banks were borrowing in foreign currency and passing currency risk onto their clients to maintain open currency positions. In 2004-2006 over 50% of loans were denominated in foreign currency. As clients did not have foreign currency income, the currency induced credit risk increased dramatically. The new requirements placed higher provisioning requirements for unhedged clients.

Two additional capital requirements were introduced linking capital with short and long-term foreign debt. With respect to capital adequacy measures, k1 ratio was set at 6%, and k2 ratio – at 12% (for a bank with a holding company 5%, 10% respectively).

Liquidity requirements consisted of current liquidity ratio, short-term liquidity ratio and minimum reserve requirements.

Current liquidity ratio (highly liquid assets/demand liabilities) was set at 30% and short-term liquidity ratio (three-months assets/three months liabilities) was set at 50%. Minimum reserve requirements for banks were set at 6% for internal liabilities, and 8% - for other liabilities.

4. Post-crisis Reforms in Regulation

In 2006 the National Bank of Kazakhstan reformed minimum reserve requirements for banks by splitting them into two groups: as percentage of domestic and foreign liabilities, reflecting the concern of high level of foreign borrowing by banks. The domestic liabilities remained at 6% and foreign liabilities were charged at a higher 8% level. As the crisis unfolded and liquidity pressures increased the regulator lowered both domestic and foreign liabilities reserve requirements to 5% and 7% (respectively) in August 2008, 2% and 3% in December 2008 and 1.5% and 2.5% in March 2009. Later the requirements were further split into short term and long term. In 2015 the requirements were divided into domestic and foreign currency. In the same year the National Bank of Kazakhstan made a transition to inflation targeting monetary policy and set the short term base rate (Monetary policy of the Republic of Kazakhstan until 2020, 2015).

To assess the soundness of banking system in 2013 the National Bank of Kazakhstan conducted the stress testing of capital adequacy of sample banks to changes in credit risks in case of negative shock of oil prices. The results showed that by the end of 2014 out of 30 sample banks 4 banks were expected to violate capital adequacy ratio (k2), by the end of 2015 –10 banks would breach tier 1 capital ratio (k1-2), and 11 banks would breach capital adequacy ratio (k2). The results of stress testing imply that by the end of 2015 capital adequacy ratio (k2) would decline to 0.087 (minimum - 0.10), and tier 1 capital ratio (k1-2) to 0.036 (minimum - 0.05), respectively (Financial Stability Report of Kazakhstan, 2013).

In order to mitigate systemic risks in future, the National Bank introduced a new model of banking regulation to be implemented from 2015. In the framework of Basel III the regulator planned introduction of liquidity ratios and changes in capital adequacy ratios during 2015-2019 (with higher levels than Basel III standards).

Capital adequacy ratios became more accommodative by decreasing total capital from 12% to 7.5%, and then planned gradual increase until 2019 (tier 1 capital from 6% to 9% and total capital from 7.5% to 12%).

Additionally, the regulator planned the introduction of the following buffers:

- conservation buffer (increase since 2015 from 2.5% to 3% for systemic banks, and from 1% to 3 % for other banks),

- countercyclical buffers (introduction not less than 12 months before the date of buffer calculation, from 0% up to 3%).
- systemic buffer, formed by systemic banks and funded with stock and net retained income (1% as of January 2016).

This approach was justified by higher volatility of economic growth of Kazakhstan along with high systemic and institutional risks of its financial institutions. The purpose of these regulatory changes was to build up banks' capacity to absorb potential losses.

However, in 2015 the dates of transition to Basel III standards were revised with keeping minimal levels of capital adequacy of banks in 2016 at levels set for 2015, and 2017 – at levels set for 2016. The regulator decreased requirements for capital adequacy for loans to small and medium enterprises, mortgage loans and defaulting loans. In 2016 the targeted value of capital adequacy ratio was lowered from 12% to 8%. As of January 2017 capital adequacy ratios conform with Basel III standards.

According to the Annual Report of the National Bank of Kazakhstan (2016), the regulator in 2016 introduced new liquidity ratios – liquidity cover ratio (LCR) and net stable funding ratio (NSFR). These liquidity ratios help to ensure sustainability of the banks to potential liquidity shortage and decrease their dependence on short term funding. The banks calculated the liquidity coverage ratio during one-year monitoring period, and then starting from second half of 2017 this ratio became obligatory with 60% level, with gradual increase by 2021 up to 100%. These regulatory changes reshaped the banking sector of Kazakhstan, with banks adjusting their balance sheets to meet new requirements in capital adequacy and liquidity measures.

In this paper we examine how these changes affected the banks through their bond prices. We used the approach kindly suggested by Colleen Baker, Christine Cumming, Julapa Jagtiani in their work 'The Impacts of Financial Regulations: Solvency and Liquidity in the Post-crisis Period' (2017).

5. Data

We divide our sample of banks into two groups based on their implicit government support. In the first 'government dependent' group we include two large banks with implicit government guarantee: Halyk Bank (Halyk) and Kazkommertsbank (KKB).

The second group focuses on 'independent' banks that never received government guarantee and includes Fortebank (FB), Kaspi Bank (KB), Bank Center Credit (BCC) and Eurasian Bank (EB).

1) Accounting Data

We use accounting data from banks' reports to the central bank for the period of 2008-2018.

For liquidity measures, we use two actual liquidity ratios: k4 and k4-2. Current liquidity ratio (k4) ratio is calculated as a ratio of monthly average of highly liquid assets to monthly average of demand liabilities.

Liquidity ratio (k4-2) is a ratio of monthly average of liquid assets, including highly liquid assets, with maturity up to 1 (one) month to monthly average of liabilities with maturity up to 1 (one) month.

For capitalization, we use actual capital adequacy ratio (k2) – a ratio of a bank's equity to its risk weighted assets.

2) Market Data

The choice of bond spreads over government bond yields as a measure of financial friction is widely used by a number of researchers, including the works of Evanoff, Jagtiani, and Nakata (2011), Beyhaghi, D'Souza and Roberts (2013) and Santos (2009). We applied data on publicly traded bonds issued in USD on global capital markets (Eurobonds) by the sample banks. The bonds in USD were chosen due to illiquidity of corporate bonds in domestic capital market.

We use the yields of the bonds issued by sample banks to calculate the yield spreads by subtracting the matching sovereign credit default swaps (CDS) yields from Bloomberg. The CDS is used as a proxy for government bonds of Kazakhstan in USD due to the absence of such bonds during 2008-2014. The government bonds of Kazakhstan in USD were issued in 2014 after a long break (Farchy & Moore, 2014).

6. Method

We made separate regression analysis for two sample groups to find answers to the following: whether and how changes in regulation of capital and liquidity requirements affected the perceived risks of the banks (via bond yields) based on their 'dependence' on government support. Additionally, we shall look at how the failure of a large bank (BTA), previously perceived as a government-backed bank, affected the bond yields of sample 'government dependent' banks.

Tests performed: to estimate the impact of risk factors of capital adequacy (k2 ratio) and liquidity (k4 and k4-2 ratios) on bond spreads the panel data analysis was used. This method allows to consider interrelation of each indicator in the system. Taking into account incomplete time-series data on some banks for the period observed, imbalanced panel data approach was applied. We performed Hausman test to find suitable models for each bank group:

A) Fixed effect model

B) Random effect model

Hausman test showed inconsistency of Random effect model (prob of Chi-Sq. Statistic =0) for both groups as random effects may be correlated by one or two regressors. Therefore, we chose Fixed effect model. The result was tested by Likelihood Ratio. In groups the normality of the model confirms that errors are normally distributed. White cross-section standard errors & covariance (no d.f. correction) when specifying the model allows to obtain result free from autocorrelation of remains.

7. Results

The purpose of our regression analysis is to examine relationship between debt spreads and risk factors (capital adequacy and liquidity ratios) between 2008 and 2018. We run separate regressions for dependent and independent groups of banks. For the measures of capital, we use k2 ratio, for liquidity measures we use k4 and k4-2 ratios. The results are reported in Annex 1.

Based on the model results we found that k2 and k4 ratios are statistically significant for both Groups while k4-2 turned out to be not significant for both Groups.

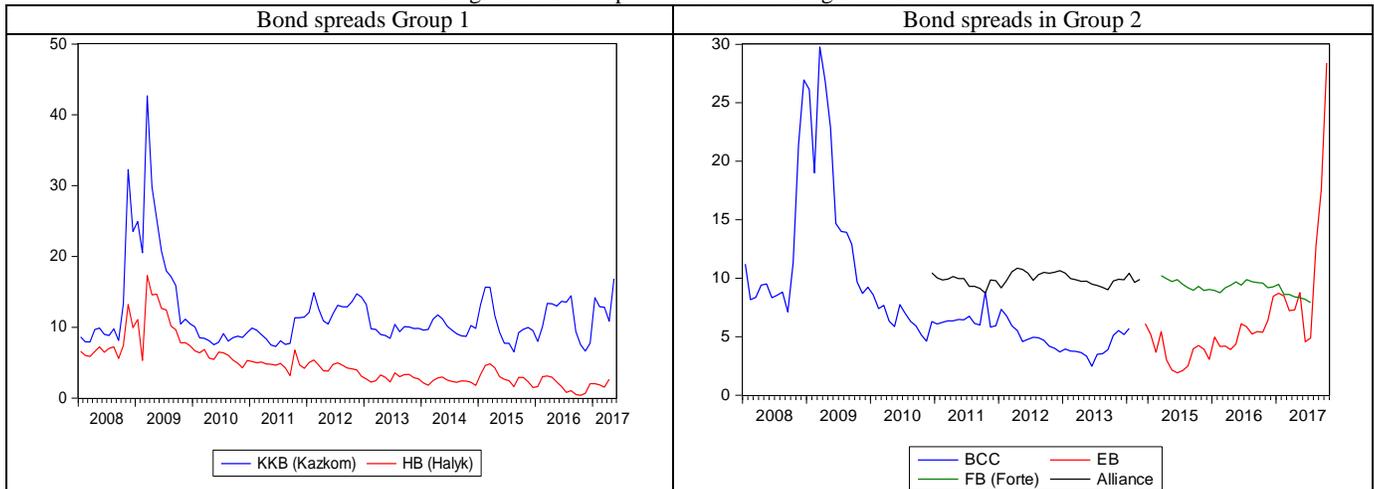
With respect to capital adequacy measure, banks from both groups gradually built up k2 ratios in 2009-2010 and ended up with more higher quality capital on their balance sheets. According to Annex 1 (Results, Group 1),

capital adequacy ratio (k2) showed negative correlation (-36.7) in Group 1. Surprisingly, the ratio of capital adequacy (39.6) in Group 2 positively affected the price as showed in Annex 1 (Results, Group 2). Capital adequacy measures (k2 ratio) had no effect on prices, which implies that market doesn't perceive them as capital strength measures. This is backed with Pierret research (2015), who argued that the stress test results would be more relevant for the market than capital ratios. However, Schmitz, Sigmund and Valderrama (2019) found that increase in regulatory capital ratios leads to decrease in cost of funding for banks.

As for liquidity measures, in post crisis period all banks increased holdings of high quality liquid assets as seen from bank's reports to the regulator. Based on results of the model it becomes clear that market reacts to changes in liquidity measures rather than capital adequacy ratios (via bond prices). This seems logical since liquidity ratios capture market fluctuations much better. As expected, the banks with good liquidity supply (namely, Halyk) had advantages and priced cheaper than banks with less liquidity. So, in both Groups current liquidity ratio (k4) positively affected bond spreads (1.67 and 1.06) according to Annex 1 (Results, Group 1 and Group 2).

Bond spreads in both Groups soared during crisis in 2008-2009. Later, bond spreads decreased and stabilized to some extent. Expectation that banks with explicit government guarantee shall be perceived as creditworthy and thus have lower spreads is not supported as seen in Diagram 1 which shows spreads of the banks in Group 1 (namely, KKB) were higher than spreads of Group 2 (namely, BCC). This could be best explained by the failure of one the largest local banks BTA Bank which nearly defaulted in 2009 (Prentice & Cohn, 2012), and investors preferred to get rid of the bonds of government related banks and added large risk premia.

Diagram 1. Bond spreads of banks during 2008-2018



Conclusion

Based on our analysis one may claim that the regulatory changes in capital adequacy and liquidity requirements have significantly affected local banks, with some differential impacts on government dependent versus independent banks.

However, in general, bond prices reacted more to the changes in liquidity measures rather than changes in capital adequacy measures.

Changes in regulation of liquidity affected the bond prices of both bank groups. Furthermore, the failure of a large government-backed bank (BTA) amplified the credit risks for the sample banks with government guarantee.

New capital measures seem to be less constraining for banks with government support, however, they continued to increase capital in post crisis period. In contrast, changes in capital measures affected bond spreads of banks without government support. These banks actively enhanced their capital during 2008-2009. Bond spreads of banks in both groups rocketed in 2008 and 2009, the prices fluctuated later but in smaller ranges.

References

- Adrian, T., Boyarchenko, N., Shin, S.H. (2015). The Cyclical of Leverage. Federal Reserve Bank of New York Staff Report № 743.
- Annual Report of the National Bank of Kazakhstan for 2008. Retrieved from: <http://www.nationalbank.kz/cont/publish5119195540.pdf>
- Annual Report of the National Bank of Kazakhstan for 2016. (2017). National Bank of Kazakhstan. Retrieved from: https://nationalbank.kz/cont/TO_16_pyecck.pdf
- Baker, C., Cumming, C., Jagtiani, J. (2017). The Impacts of Financial Regulations: Solvency and Liquidity in the Post-crisis Period. *Journal of Financial Regulation and Compliance*, 25(3), 253-270.
- Basel Committee on Banking Supervision, Principles for Sound Liquidity Risk Management and Supervision. (2008). Retrieved from: <https://www.bis.org/publ/bcbs144.pdf>
- Basel Committee on Banking Supervision. (October 2018). Fifteenth progress report on adoption of the Basel regulatory framework. Retrieved from: <https://www.bis.org/bcbs/publ/d452.pdf>
- Beyhaghi, M., D'Souza, C., Roberts, G. (2013). Funding Advantage and Market Discipline in the Canadian Banking Sector. Retrieved from: <https://www.bankofcanada.ca/wp-content/uploads/2013/12/wp2013-50.pdf>
- Cetorelli, N., Goldberg, L. (2011). Global Banks and International Shock Transmission: Evidence from the Crisis. *IMF Economic Review* 59, 41–76.
- Chen, S.H. (2013). What determines bank productivity? International evidence on the impact of banking competition, bank regulation, and the global financial crisis. *Global Banking, Financial Markets and Crises*, 141-171.
- Correa, R., Lee, K., Sapriza, H., Suarez, G. (2012). Sovereign Credit Risk, Banks' Government Support, and Bank Stock Returns around the World. FRB International Finance Discussion Paper № 1069. Retrieved from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2976762
- Evanoff, D.D., Jagtiani, J.A., Nakata, T. (2011). Enhancing Market Discipline in Banking: The Role of Subordinated Debt in Financial Regulatory Reform. *Journal of Economics and Business*, 63(1), 1–22.
- Fama, E. (1969). Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance*, 25(2), 383-417. Papers and Proceedings of 28th Annual Meeting of the American Finance Association, New York.
- Farchy, J., Moore, E. (2014). Investors snap up Kazakhstan dollar bond. *Financial times*. Retrieved from: <https://www.ft.com/content/4f4c0a82-4e21-11e4-bfda-00144feab7de>
- Financial Stability Report of Kazakhstan. (2013). National Bank of Kazakhstan and Financial Supervision Agency of the Republic of Kazakhstan. Retrieved from: <http://www.nationalbank.kz/cont/publish68393424327.pdf?switch=russian>
- Financial Stability Report of Kazakhstan. 2007. National Bank of Kazakhstan and Financial Supervision Agency of the Republic of Kazakhstan. Retrieved from: <http://www.nationalbank.kz/cont/publish2448544076.pdf?switch=russian>

- Frank, N., Hesse, H. (2009). Financial Spillovers to Emerging Markets During the Global Financial Crisis. IMF, Working Paper № 09/104.
- Gorton, G. (2018). Financial Crises. Retrieved from: <http://dx.doi.org/10.2139/ssrn.3169845>
- Gorton, G., Metrick, A. (2012). The Financial Crisis of 2007-2009. Yale ICF Working Paper, № 12-20. <https://doi.org/10.1108/JFRC-02-2017-0027>
- IMF Survey. (2010). Kazakhstan on Road to Recovery, But Banking System Still Weak. Retrieved from: <https://www.imf.org/en/News/Articles/2015/09/28/04/53/socar081710a>
- Jagtiani, J., Kaufman, G., Lemieux, C. (2002). The Effect of Credit Risk on Bank and Bank Holding Company Bond Yields: Evidence from the Post-FDICIA Period. *Journal of Financial Research*, 25, 559-575.
- Monetary policy of the Republic of Kazakhstan until 2020. (2015). National Bank of Kazakhstan. Retrieved from: <http://www.nationalbank.kz/cont/publish30526128968.pdf>
- Morgan, D., Stiroh, K. (2000). Bond Market Discipline of Banks. Federal Reserve Bank of Chicago Proceedings, 494-526.
- Pierret, D. (2015). Systemic Risk and the Solvency-Liquidity Nexus of Banks. *International Journal of Central Banking*, 11(3), 193–227.
- Prentice, A., Cohn, C. (2012). Timeline: Problems at Kazakh bank BTA. The Thomson Reuters. Retrieved from: <https://www.reuters.com/article/kazakhstan-bta-timeline-idUSL6E8CC3TA20120112>
- Resolution of the Government of the Republic of Kazakhstan N1085. (November 25, 2008). Joint plan of action on stabilization of economy and financial system for 2009-2010 of the Government of the Republic of Kazakhstan, National Bank of Kazakhstan and Agency of the Republic of Kazakhstan on Regulation and Supervision of financial market and financial organizations. Retrieved from: <https://zakon.uchet.kz/rus/docs/P080001085>
- Santos, J. (2009). Do markets “discipline” all banks equally? *Journal of Financial Economic Policy*, 1(1), 107-123. Retrieved from: <https://ssrn.com/abstract=1479860>
- Schich S., Lindh S. (2012). Implicit Guarantees for Bank Debt: Where Do We Stand. OECD Journal: Financial Market Trends, 1, 22.
- Schich, S., Aydin, Y. (2014). Measurement and analysis of implicit guarantees for bank debt: OECD survey results. OECD Journal: Financial Market Trends, 1, 1-29.
- Schmitz, S., Sigmund, M., Valderrama, L. (2019). The interaction between bank solvency and funding costs: A crucial effect in stress tests. *Journal Economic Notes*, 48(2). Retrieved from: <https://doi.org/10.1111/ecno.12130>
- Tsesmelidakis, Z., Merton, R.C. (2015). The value of implicit guarantees. Working Paper. Retrieved from: <https://rmi.nus.edu.sg/documents/events/62%20-%20Zoe%20Tsesmelidakis.pdf>

Annex 1

Correlated Random Effects - Hausman Test (GROUP 1)

Equation: LSR

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	242.968231	1	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
K4	1.881170	1.760900	0.000060	0.0000

Cross-section random effects test equation:

Dependent Variable: SPREAD

Method: Panel Least Squares

Date: 01/27/19 Time: 14:08

Sample: 1 225

Periods included: 113

Cross-sections included: 2

Total panel (unbalanced) observations: 225

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.930959	0.309404	19.16898	0.0000
K4	1.881170	0.166943	11.26836	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.614894	Mean dependent var	8.230584
Adjusted R-squared	0.611425	S.D. dependent var	5.596080
S.E. of regression	3.488360	Akaike info criterion	5.349984
Sum squared resid	2701.442	Schwarz criterion	5.395532
Log likelihood	-598.8732	Hannan-Quinn criter.	5.368368
F-statistic	177.2327	Durbin-Watson stat	0.700766
Prob(F-statistic)	0.000000		

Redundant Fixed Effects Tests (GROUP 1)

Equation: EQ_GROUP1_FE

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	134.255745	(1,220)	0.0000
Cross-section Chi-square	107.188099	1	0.0000

Cross-section fixed effects test equation:

Dependent Variable: SPREAD

Method: Panel Least Squares

Date: 01/29/19 Time: 07:30

Sample: 2008M01 2017M05

Periods included: 113

Cross-sections included: 2

Total panel (unbalanced) observations: 225

White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	23.58500	2.241268	10.52306	0.0000
K2	-98.82854	11.16151	-8.854407	0.0000
K4	1.204184	0.560391	2.148828	0.0327
K4_2	-0.296719	0.134841	-2.200503	0.0288
R-squared	0.409238	Mean dependent var	8.230584	
Adjusted R-squared	0.401218	S.D. dependent var	5.596080	
S.E. of regression	4.330303	Akaike info criterion	5.786770	
Sum squared resid	4144.086	Schwarz criterion	5.847500	
Log likelihood	-647.0116	Hannan-Quinn criter.	5.811281	
F-statistic	51.03094	Durbin-Watson stat	0.332884	
Prob(F-statistic)	0.000000			

Correlated Random Effects - Hausman Test (GROUP 2)

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	16.845557	3	0.0008

** WARNING: estimated cross-section random effects variance is zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
K2	39.642158	16.817291	166.683334	0.0771
K4	1.064564	1.036641	0.001219	0.4239
K4_2	-0.060025	-0.087546	0.001322	0.4491

Cross-section random effects test equation:

Dependent Variable: SPREAD

Method: Panel Least Squares

Date: 01/29/19 Time: 08:08

Sample (adjusted): 2008M08 2017M10

Periods included: 103

Cross-sections included: 4

Total panel (unbalanced) observations: 170

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.546986	2.415726	0.226427	0.8212
K2	39.64216	14.88311	2.663567	0.0085
K4	1.064564	0.154020	6.911865	0.0000
K4_2	-0.060025	0.059423	-1.010136	0.3139

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.342325	Mean dependent var	8.460939
Adjusted R-squared	0.318116	S.D. dependent var	4.672975
S.E. of regression	3.858768	Akaike info criterion	5.578878
Sum squared resid	2427.084	Schwarz criterion	5.707999
Log likelihood	-467.2046	Hannan-Quinn criter.	5.631273
F-statistic	14.14047	Durbin-Watson stat	0.431782
Prob(F-statistic)	0.000000		

Redundant Fixed Effects Tests (GROUP 2)

Equation: EQ_GROUP2_FE

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.615186	(3,163)	0.0011
Cross-section Chi-square	16.719205	3	0.0008

Cross-section fixed effects test equation:

Dependent Variable: SPREAD

Method: Panel Least Squares

Date: 01/29/19 Time: 08:01

Sample (adjusted): 2008M08 2017M10

Periods included: 103

Cross-sections included: 4

Total panel (unbalanced) observations: 170

White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
K2	16.81729	6.763610	2.486437	0.0139
K4	1.036641	0.299889	3.456754	0.0007
K4_2	-0.087546	0.036377	-2.406616	0.0172
C	4.487891	1.203795	3.728120	0.0003
R-squared	0.274356	Mean dependent var	8.460939	
Adjusted R-squared	0.261242	S.D. dependent var	4.672975	
S.E. of regression	4.016469	Akaike info criterion	5.641932	
Sum squared resid	2677.916	Schwarz criterion	5.715715	
Log likelihood	-475.5642	Hannan-Quinn criter.	5.671872	
F-statistic	20.92081	Durbin-Watson stat	0.382155	

Prob(F-statistic) 0.000000

Results

Group 1 (KKB, Halyk)

Dependent Variable: SPREAD

Method: Panel Least Squares

Date: 01/29/19 Time: 07:13

Sample: 2008M01 2017M05

Periods included: 113

Cross-sections included: 2

Total panel (unbalanced) observations: 225

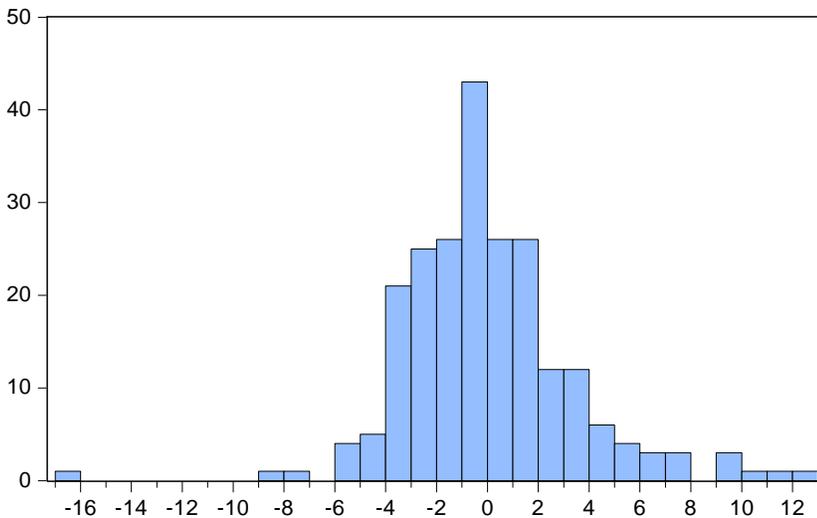
White cross-section standard errors & covariance (no d.f. correction)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.13677	2.076063	5.846053	0.0000
K2	-36.73977	10.69163	-3.436311	0.0007
K4	1.669831	0.512602	3.257559	0.0013
K4_2	-0.018221	0.095532	-0.190734	0.8489

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.633125	Mean dependent var	8.230584
Adjusted R-squared	0.626454	S.D. dependent var	5.596080
S.E. of regression	3.420235	Akaike info criterion	5.319267
Sum squared resid	2573.562	Schwarz criterion	5.395180
Log likelihood	-593.4176	Hannan-Quinn criter.	5.349906
F-statistic	94.91462	Durbin-Watson stat	0.519363
Prob(F-statistic)	0.000000		



Series: Standardized Residuals	
Sample 2008M01 2017M05	
Observations 225	
Mean	7.89e-18
Median	-0.395173
Maximum	12.59125
Minimum	-16.48956
Std. Dev.	3.389560
Skewness	0.339176
Kurtosis	6.508349
Jarque-Bera	119.7063
Probability	0.000000

Group 2 (BCC, EB, FB, ALLIANCE)

Dependent Variable: SPREAD

Method: Panel Least Squares

Date: 01/29/19 Time: 08:01

Sample (adjusted): 2008M08 2017M10

Periods included: 103

Cross-sections included: 4

Total panel (unbalanced) observations: 170

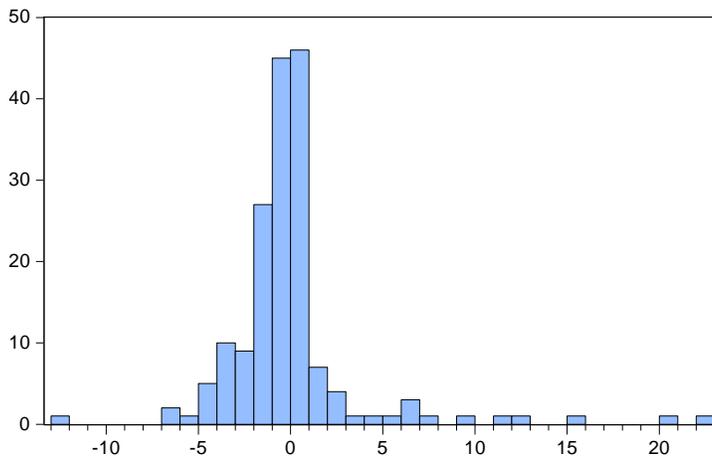
White cross-section standard errors & covariance (no d.f. correction)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
K2	39.64216	12.17377	3.256358	0.0014
K4	1.064564	0.285267	3.731819	0.0003
K4_2	-0.060025	0.048312	-1.242447	0.2159
C	0.546986	1.788807	0.305783	0.7602

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.342325	Mean dependent var	8.460939
Adjusted R-squared	0.318116	S.D. dependent var	4.672975
S.E. of regression	3.858768	Akaike info criterion	5.578878
Sum squared resid	2427.084	Schwarz criterion	5.707999
Log likelihood	-467.2046	Hannan-Quinn criter.	5.631273
F-statistic	14.14047	Durbin-Watson stat	0.431782
Prob(F-statistic)	0.000000		



Series: Standardized Residuals
 Sample 2008M08 2017M10
 Observations 170

Mean 1.84e-16
 Median -0.310515
 Maximum 22.83074
 Minimum -12.60989
 Std. Dev. 3.789650
 Skewness 2.834137
 Kurtosis 17.03611

Jarque-Bera 1623.086
 Probability 0.000000

Workfile Statistics

Date: 01/28/19 Time: 16:52

Name: BOND_DATA_ANALYSIS

Number of pages: 2

Page: group1

Workfile structure: Panel - Monthly

Indices: BANK x DATA

Panel dimension: 2 x 113

Range: 2008M01 2017M05 x 2 -- 225 obs

Object	Count	Data Points
Series	6	1350
Alpha	1	225
Coef	1	750
Total	8	2325

Page: group2

Workfile structure: Panel - Monthly

Indices: BANK x DATA

Panel dimension: 4 x 110

Range: 2008M01 2017M10 x 4 -- 177 obs

Object	Count	Data Points
Series	6	1062
Alpha	1	177
Coef	1	750
Total	8	1989

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