CD Index, A New Methods for Measure Banking Crisis

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Abstract

The global financial crisis has a bad impact for domestic financial systems. Banking system is important component from financials system which has more attention. Evidence from Indonesia crisis in 1998 fromAsian currency crises, subprime mortgage America in 2008, the Volatilityof US Economic in 2011, and slowdown china economic in 2015 that made systematic risk for financial systems and banking system in Indonesia. Crisis identification for individual bank is important to avoid systematic risk. Using Index for measuring banking crisis will give crisis signal before the crisis happen. Crisis and Default Index can predict and measure banking crisis more accurate than other measurement. The four components of banking risk crisis have been included. These components are liquidity risk, Credit risk, interest rate risk, and exchange rate risk. Furthermore, CD Index can describe duration of the crisis, periods of the crisis, and the component which can trigger a crisis. Samples of this research are all commercial banks that listed in Indonesian stock exchange period 2010-2014. The result is 18 banks which join Indonesian stock exchange have indicated crisis in 2011 and 2014. In 2010 BTN was identified Crisis, it caused the score of credit risk and investment risk is riskier than the others. Danamon bank has a bad score from credit component, it can trigger crisis in 2011. Then in 2012 and 2013Sinarmas bank and J trust bank have been declared crisis.J trust bank was still in crisisin2014, because it had a bad score for the all components.

Keywords: *Banking Crisis, CD Index, Liquidity Risk, Credit Risk*

JEL: G21

Abstrak

Krisis keuangan global telah membawa dampak buruk bagi sistem keuangan dalam negeri. Perbankan adalah bagian dari sistem keuangan yang harus mendapat perhatian lebih. Contoh krisis keuangan di indonesia pada tahun 1998 berasal krisis mata uang di asia, pada tahun 2008 krisis kredit perumahan di Amerika, ketidakstabilan ekonomi di Amerika pad tahun 2011, dan perlambatan ekonomi di China yang dapat menyebabkan resiko sistemik pada sistem keuangan dan sistem perbankan yang ada di Indonesia. Identifikasi krisis untuk individu perbankan sangat penting untuk mencegah resiko sistematis. Pengunaan Indeks dapat memprediksi terjadinya krisis sebelum krisis terjadi. Penggunaan CD Indeks dapat memprediksi krisis perbankan secara akurat. empat komponen resiko perbankan telah dimasukan. Komponen resiko tersebut adalah resiko likuiditas, resiko kredit, resiko perubahan suku bunga, dan resiko nilai tukar mata uang. Selanjutnya CD Indeks dapat menjelaskan durasi, periode, dan komponen yang memicu terjadinya krisis. Sampel penelitian adalah perbankan yang terdaftar di Bursa Efek Indonesia periode 2010-2014. Hasilnya adalah 18 bank teridentifikasi krisis pada tahun 2011dan tahun 2014. Pada tahun 2010 bank BTN

teridentifikasi krisis yang disebabkan komponen kredit dan investasi lebih beresiko dari bank lain. Bank Danamon memiliki skor yang kurang baik dari komponen kredit sehingga dapat memicu krisis pada tahun 2011. Selanjutya pada tahun 2012 dan 2013 bank Sinarmas dan bank J Trust dinyatakan krisis. Pada tahun 2014 bank J trus tetap krisis dikarenakan memiliki skor yang buruk pada setiap komponen.

Kata kunci: *Krisis perbankan, CD Indeks, Resiko Likuiditas, Resiko Kredit*

JEL: G21

1. Introduction

Global financial crisis have been impact for all economic component. Banking system is most crucial sector that can influenced from financials crisis. According to Mehrez and Kaufman (1999) explain that banking sector must have more attention to avoid systemic risk. Global financial crisis like a pandemic has made bad effect to domestic economics system(Hagen and Ho 2003b). Global financial crisis in 1998, 2008, and 2011 has made many banksin Indonesia collapse.The central bank and the government has means to reduce a systematic risk. It was need a method to predict crisis.

The global economic in the begining of 2014 until the end of 2015 hasresponseto China economics slowdown. The panic seen in China financials market, sliding Yuan, and stock trading suspension (Curran 2016). The GDP ofChina steady but always decrease from 12% in beginning 2010 until 7% at December 2015. The other hand the CSI 300 index has a bubble in 2015. It has great value was a peak in 2015 but fall about 30 percent at the end of 2015(Publication Central Bank of Republic China 2015). The condition of China economic slowdown has a sentiment response from the other countries. It because china in the world's no 2 economic according to Christine Lagarde, managing director of the International Monetary Fund is telling about China slowdown impact for emerging economy. The developing countries such as Indonesia need to be vigilant to handle potential spillovers from China's slowdown and tightening of global financial conditions(Yan 2015).

Zhuang and Dowling (2002) explain that global sector can be affect to domestic economic sector. Indonesia has decline PDB from 2010 quarter 3. The PDB Indonesia has fallen from 7 % to 4,7% at the quarter 3 in 2015 (BPS 2015). JKSE index also has decline shortly from 5500 on May 2015 get down about 20% to 4300 on September 2015 (YahooFinance 2015). Tumble down stock price in general cause a lots of capital outflow increase (Zhuang and Dowling 2002; Lestano and Kuper 2003). The country which has decliningPDB can call recession. Many research who use event base crisis identification has proven that decline PDB which has made systemic banking crisis (Demirgüç-Kunt and Detragiache 1998, 2000, 2002; Hardy and Pazarbasioglu 1998).

After economic of USA grow up and the federal reserved raise interest rate in 2015 that make US dollar come back to USA and many investor choice investment to USA(Russel and Appelbaum 2015). The impact for Indonesia to reserved foreign currency nearly gone. This condition would made domestic currency fall off. In 2015 rupiah always has depreciation. Rupiah has 9.800 per US dollar fall off in 2015 became 13.700(Yahoo Finance 2015). Hagen and Ho (2003a) explain domestic currency depreciation made adjust of banking balance sheet every companies which has foreign liabilities.

2. Research Method

Krugman (1979)argue that financials crisis a circumstated balance sheet problem. The crisis happen because the country nearly lose their reserve.The balance of payment have a crisis because speculator buy up and more reserved to take a benefit from this condition. Flood and Garber (1984) explain that reserve and credit growt or domestic money supply. The speculator

have known it and not wait until the reserved became empty. The definition of crisis in first come from reserves nearly lose. When the government try to use reserves to defend exchange rate is volatile, there can be crisis because the foreign curency has out of the country.

Obstfeld and Rogoff (1986) tell about financials crisis in European Union at 1982-1985. In the beginning of European Unionthe exchange rate is fixed but can move still 2,5% in up and down. All of the central bank defend their exchange rate with buy or sell currency. And will be move if cannot able to defend the value,a new standart for these country has assigned. The DM is a major and strong currency in that time because low inflation. Since Germany going tounity, market response to Germany growth is more than before. The Bundes bank raises interest rate and took DM over the country. After Bundes bank monetary policy all of country and market confirm their currency into a new value. The DM always looking in the market without clearly reason or just speculate. The DM gradually increases until the peak in end of 1983. Many banking system and companies unable to payback in DM, so the DM fall sharply in the beginning 1984. The value of DM has back like Germany are west and east. And it call bubble.

In the 1997 Asian crisis has occured by declining ofall the Asian currency. All of the Asian currency fall down consecutive and for a long periods (Zhuang and Dowling 2002). On the other hand Reinhart et al. (2000) defined the Asian crisis not only problem about balance sheet but role of the supervision to preventing financials crisis is important. Main problem in the moral hazard is guarrante bailout bank in trouble by government. It has bad impact for increase nonperforming loans.

For identification banking crisis can look at event based. It is easy and prove the bank has a trouble in that period. Demirgüç-Kunt and Detragiache (1998, 2000, 2002) has claim a bank which crisis if has nonperforming loan is more than 10%. Hardy and Pazarbasioglu (1998) identified bank crisis if the bank suspend and has intervention from government. However the identification with event based is lack because cannot explain risk component which vulnerable to crisis.

Musdholifah (2013) contend a measure bank crisis with index has brought more benefit. The first index can show the banking risk component that trigger to crisis. Then the index explains duration of the crisis, and the next use index can measure crisis before crisis happen because the tolerance of crisis are depend by researcher.

Kibritcioglu (2002)build identification crisis with the name is Banking Sector Fragility or BSF. It has 3 components to measure banking crisis. The first is credit risk that measure level of credit as productive asset, next is liquidity risk will evaluate banking liabilities as level of deposits, and the last is exchange risk that measure liabilities as a foreign debt. The formula of BSF as follow

$$BSF = \frac{\left(\frac{Credit_t - \mu_{credit}}{\delta_{credit}}\right) + \left(\frac{FX\ debt_t - \mu_{FLeverage}}{\delta_{FLeverage}}\right) + \left(\frac{Deposit_t - \mu_{deposit}}{\delta_{Deposit}}\right)}{3}$$

Where:

$Credit_t$ = Amount credit from $credit_{t-1}$

$FX\ debt_t$ = Amount Foreign Debt

$Deposit_t$ = Amount Depostits from $depostit_{t-1}$

Kibritcioglu (2002) explain bank crisis if BSF score under means in the period or above means with plus three standart deviation. Bhattacharya and Roy (2009) was modified BSF index and substituted foreign currency risk with domestic interest rate risk. It called Banking Sector Soundness. It has three component measurement like BSF Index. The BSF index has a liquidity risk, credit risk, and interest rate risk. Bhattacharya and Roy (2009) explain interest rate risk is more vulnerable for developing country. The formula of Banking Sector Soundness

as follow.

$$BSS = \frac{\left(\frac{Credit_t - \mu_{credit}}{\delta_{credit}}\right) + \left(\frac{Investment_t - \mu_{Invenstment}}{\delta_{Investment}}\right) + \left(\frac{Deposit_t - \mu_{deposit}}{\delta_{Deposit}}\right)}{3}$$

Whrere

Credit = ($Credit_t$ – $Credit_{t-1}$) / $Credit_{t-1}$

Investment = ($Investment_t$ – $Investment_{t-1}$)/ $Investment_{t-1}$

Deposit = ($Deposits_t$ – $Deposits_{t-1}$)/ $Deposits_{t-1}$

Bhattacharya and Roy (2009) argue that banking crisis have negative score from formula BSS index. So the value of BSS index is binary. The bank has crisis if the BSS value ≤ 0 and the value is 1. The bank has non crisis if has BSS value is positive or BSS > 0. It will have value 0 for noncrisis category.

Musdholifah (2015)combined the BSS and BSF index with four component. The liquidity risk and credit risk are available in BSF and BSS Index. Exchange rate risk is available in BSF indexhowever interest rate risk just available in BSS index so It can Combine component and identification crisis for more accurate methods. On the other hand four componentswhich include can describe banking condition per periods. The first is liquidity risk has impact with trust of the depositor. Next is credit risk could show about earning, then interest rate risk show internal bank with volatile macroeconomics, and the last exchange rate risk will show impact of global condition. This methods call Crisis and Default Index with four component measure crisis. CD Indexformula as bellow.

$$CDIndex = \frac{\left(\frac{Cr_t - \mu_{credit}}{\delta_{credit}}\right) + \left(\frac{Inv_t - \mu_{Inven}}{\delta_{Investment}}\right) + \left(\frac{Dept_t - \mu_{de}}{\delta_{Deposit}}\right) + \left(\frac{FDebt_t - \mu_{F.debt}}{\delta_{F.debt}}\right)}{4}$$

Where

Cr = ($Credit_t$ – $Credit_{t-1}$) / $Credit_{t-1}$

Inv = ($Investment_t$ – $Investment_{t-1}$)/ $Investment_{t-1}$

Dept = ($Deposits_t$ – $Deposits_{t-1}$)/ $Deposits_{t-1}$

Fdebt = (Foreign $Debt_t$ – Foreign $Debt_{t-1}$) / Foreign $Debt_{t-1}$

The bank crisis assumes if CDI < 0 or has negative score. If the bank has CDI > 0 the bank has recover or safe from crisis threat. The value of CD Indexs is 0 and 1. If bank has negative score will mark as 1 or crisis and the bank which has positive value CD index will mark 0 for uncrisis. Value 1and 0 can be used for logistic regression, but if want to see most vunerable bank which has crisis can use Rangking each periods. Using rangking show moving performance and revive from crisis periods before.

This research uses descriptive statistic for measure banking crisis. The method is combine liquidity risk, credit risk, exchange rate risk, and the last is interest rate risk. Four components has made trigger for banking crisis. This method can show the most risk component that cause trouble in banking system. The combine 4 component will give score and explain every banking in Indonesia run into Banking Risk.

The populate this research are all of the banking in Indonesia. The sample this research is a purposed sampling is bank who listed in Indonesian Stock Exchange in 2010 until 2014. Amount of the bank has listed in Indonesian Stock Exchange are 27 bank. The data is a financials report has audited by public accounting in Indonesia Stock Exchange webpage.

3. Result and Discussion

<Table 1 and Table 2bellow in appendix>

Figure 1 explain 14 banks has otherwise crisis. And figure 2 has showed in 2010 BTN is got a high probability crisis. Themain score is – 1,15. The crisis in bank BTN cause credit with the score is – 3,24 and the financials investment score is -1,38. This value is so poor than the other bank change in credit and investment score. Pundi Indonesian bank has identified crisis too. It probability crisis because had negatif score for percise the main scoreCD Indexof Pundi Indonesian bank is -0,75. Crisis in Pundi bank that caused credit score is – 2,56 and the deposit score is -1,77.

In 2011 there are 18 banks has identified crisis. The most crisis bank in 2011 isDanamon bank with the main score of CD Index is -0,67. Credit factor and score of financials investment has a under value than other bank. Danamon bank identified posibility crisis because the financial investment score, credit score and deposit score is so small than the other bank in 2011. Then QnB Kesawen bank has posibility Crisis because the financials investment score vulnerable and triger crisis posibility. Next is Bukopin bank with the value -0,49 in main CD Index Score. Fall down financials investment score for about -1,35 and fall down from the credit score is about – 0,43 it so weak score from the other bank that cause Bukopin Bank identified more probably crisis banking.

Hair Sinarmas bank, Mega bank, BCA and other 9 bank was occured probably crisis in 2012. Sinarmas bank has -1,21 in main CD Index score. Probably Crisis in Sinarmas bank was cause credit and deposit score has a bad value than the other bank. Mega Bank got -1,06 in CD Index score. It was crisis because three component has a bad score there are foreign debt, credit, and financials investment. BCA also has a fall down score that make it posibility crisis. The CD index of BCA in 2012 is -0,83 it because foreign debt fall down with value -2,43 also -0,76 in liquidity risk it was slow altaration from the other bank.

In 2013 there are 12 bank has crisis. The Artha Graha bank most crisis cause had a bad score for all component it has identificated crisis with the CD Index -0,77. If look at the table 3 about ranking of probablycrisis, the Sinarmas bank has a revive form crisis in previous year.but in the 2013 bank Sinarmas still occuredprobably crisis but the score is lower from the last period. J trust bank or the previos name is Century bank identified crisis in 2013 with the CD index is -0,74. J trust bank has a bad score for credit and deposit are lower moving than other bank in 2013.

J trust bank still crisis in 2014. In figure 2 show J trust bank in the peak of rank probability crisis. In 2014 CD index of J trust bank increase from -0,74 at 2013 become – 1,01 in the 2014. In 2014 J trust bank has a bad score for all components in CD index. The probability crisis in J trust bank in 2014 main cause is fall down credit about -1,24 and fall down deposits about -1,03 also other risk component has a negativ score. In the 2014 found 18 banks are crisis. But J trust bank has a lowest score than the other. But many bank has identified crisis in previous periods has a revive for example Artha Graha International bank, Sinarmas bank, Danamon bank, and BTN.

4. Conclusion

Crisis and Default Index is a methodfor measure banking crisis which build from fourriks component indicator. There are liquidity risk, credit risk, currency exchange risk, and volatile interest rate.It can use for every bank because all ofrisk component available in banking system. CD Index can measure the most vulnerable risk that impact crisis happen. The other benefit of CD Index method is can show the cycle of period crisis and recovery from crisis individual bank in Indonesia.From calculate CD Index it has shown 14 bank in 2010 has

been identfied crisis with BTN is most posibility, in 2011 Bukopin bank and 17 other bank probability crisis, in 2012 there are 11 bank be avowed crisis which Mega bank and BCA has high probability crisis, in 2013 the artha graha and J trust bank was identified crisis but Sinarmas bank has a revive crisis from previosu year.For 2014 J trust still identificated and more riskier crisis than the other bank in that periods.

References

Bhattacharya, B. Roy, TNS. 2009. Forewarning Indicator System for Banking Crisis in India [internet]. [Cited in 2015]. Available from http://ssrn.com/abstract=1906576.

BPS. 2016. Laju Pertumbuhan PDB Atas Dasar Harga Konstan 2000 Menurut Lapangan Usaha (Persen), 2000-2014 [internet]. [Cited in 2006 January 9]. Available from http://bps.go.id/linkTableDinamis/view/id/829.

Curran, E. 2016. China Panic Clashes With Outlook for Modest Growth Slowdown [internet]. [Cited in 2016 January 9]. Available from http://www.bloomberg.com/news/articles/2016-01-07/china-panic-clashes-with-outlook-for-modest-2016-growth-slowdown.

Demirgüç-Kunt, E. Detragiache. 1998. The Determinants of Banking Crises in Developing and Developed Countries. *IMF Staff Papers*. 45(1)

Demirgüç-Kunt, E. Detragiache. 2000. Monitoring Banking Sector Fragility: A Multivariate Logit Approach. *The World Bank Economic Reviews*. 14(2).

Demirgüç-Kunt, E. Detragiache. 2002. Does deposit insurance increase banking system stability? An empirical investigation. *Journal of Monetary Economics*. 49: 1373–1406.

Flood, RP. Garber, PM.. 1984. Collapsing exchange-rate regimes: some linear examples. *Journal of International Economics*. 17(1): 1-13.

Hagen, Ho. 2003a. Money Market Pressure and the Determinants of Banking Crises. *Working Paper Center for European Integration Studies*.

Hagen, Ho. 2003b. Twin Crises A Reexamination of Empirical Links. *working Paper of Center for European Integration Studies, University of Bonn*.

Hardy, DC. Pazarbasioglu, C. 1998. Leading Indicators of Banking Crises: Was Asia Different? *IMF Working Paper*.

Kibritcioglu, A. 2002. Excessive Risk.Taking, Banking Sector Fragility, and Banking Crises. *Working Paper University of Illinois*. 02-0114.

Krugman, P. 1979. A Model of Balance-of-Payment Crises. *Journal of Money, Credit and Banking*, 11(3): 311-325.

Lestano, Kuper. 2003. Indicators of financial crises do work! An early-warning system for six Asian countries. *Working Paper*.

Mehrez, G. Kaufman, D. 1999. Transparency, Liberalization and Financial Crises. *Working Paper*.

Musdholifah. 2013. Predicting Banking Crisis in Six Asian Countries. *European Journal of Business and Management*. 5(28).

Musdholifah. 2015. Using Index for Predicting Banking Crisis in Asian Countries. *International Journal of Empirical Finance*. 4(3).

Obstfeld, M. Rogoff, K.. 1986. Ruling out divergent speculative bubbles. *Journal of Monetary Economics*. 17(3): 349-362.

Publication Central Bank of Republic China. 2015. *Macro environmental factors potentially affecting financial sector*. Central Bank of the Republic of China (Taiwan) 2015 [internet]. [Cited in 2015 January 9]. Available from http://www.cbc.gov.tw/sp.asp?q=GDP+2015&xdurl=mp%2FensearchList.asp&mp=2&send_btn=Search.

Reinhart, C. Goldstein, M. Kaminsky, G. 2000. Early Warning System: An Assessment of Vulnerability. *MPRA Paper* No. 24579.

Russel, K. Appelbaum, B.. 2016. *Why the Fed Raised Interest Rates*. The New York Times 2015 [internet]. [Cited in 2016 January 9]. Available from http://www.nytimes.com/interactive/2015/09/12/business/economy/fed-rates-explainer.html?_r=0.

Yahoo Finance. *Chart IDR-USD* 2015 [internet]. [Cited in 2015). Available from https://finance.search.yahoo.com/search/;_ylc=X3oDMTI0dWxqa2tpBGtleXcDTlBMIGluZG9uZXNpYQRtaWQDbWVkaWFxdW90ZXNzZWFyY2gEc2VjA3VoYjIEc2xrA2ZpbmFuY2Vfc2VhcmNo?p=NPL%20indonesia&type=2button.

YahooFinance. 2015. *jakarta Composite Index* 2015 [internet]. [Cited in 2015 December 3]. Available from http://finance.yahoo.com/echarts?s=^JKSE+Interactive#{%22showArea%22:false,%22lineWidth%22:%224%22,%22lineType%22:%22line%22,%22allowChartStacking%22:true}.

Yan, S. 2016. *IMF: Global markets should brace for China slowdown*. CNN 2015 [internet]. [Cited in 2016 January 20]. Available from http://money.cnn.com/2015/09/01/news/economy/imf-china-slowdown-emerging-markets/.

Zhuang, J. Dowling, JM.. 2002. Causes of the 1997 Asian Financial Crisis: What can an early warning system model tell us?: ERD. *Working paper series*

Appendix 1

Table 1 Risk Component Each Bank in Indonesia

	Foreign debt					Deposit					Credit					Financial Investment				
	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
BMRI	0,72	-0,19	0,10	1,41	-0,19	-0,04	-0,40	-0,63	-0,07	0,26	0,07	-0,35	-0,05	-0,10	-0,05	0,75	-0,26	0,64	-0,38	-0,49
BBNI	-0,19	-0,12	0,10	1,96	-0,19	-1,22	-0,33	-0,73	-0,37	-0,20	-0,28	-0,37	-0,17	-0,05	-0,28	0,71	-0,21	1,76	-1,23	-0,30
BBRI	-0,71	-0,21	-0,29	-0,87	-0,19	0,35	-0,23	0,27	-0,18	0,54	-0,07	-0,37	-0,13	-0,07	-0,06	-0,45	0,05	1,34	-0,79	-1,37
BBTN	-0,21	-0,22	0,16	-0,20	-0,19	0,22	-0,32	0,86	-0,10	-0,62	-3,25	2,64	0,11	-0,11	0,00	-1,39	0,33	1,96	-1,14	-1,39
AGRO	-0,21	-0,22	0,16	-0,20	-0,19	-0,99	-0,29	0,87	-2,74	-0,39	-0,66	-0,43	0,75	0,56	0,65	-1,11	0,01	-0,51	0,34	1,04
INPC	-0,21	-0,22	0,16	-0,20	-0,19	-0,37	-0,29	-0,69	-0,57	-0,29	-0,53	-0,37	-0,49	-0,83	-0,22	-0,51	0,22	1,65	-1,49	-0,77
BKPN	-0,42	-0,22	3,31	-0,94	-0,19	0,34	-0,10	-0,23	-0,55	0,07	0,09	-0,32	-0,71	-0,64	-0,05	-0,26	-1,35	-0,20	-0,71	1,92
BABP	-0,21	-0,22	0,16	-0,20	-0,19	0,29	-0,68	0,34	-0,24	-0,16	-0,10	-0,47	-1,25	-0,64	-0,06	-1,06	-0,23	-0,12	1,18	0,11
BBCA	-1,77	0,36	-2,43	0,60	5,00	-0,59	-0,28	-0,76	-0,06	0,15	0,18	-0,33	0,13	-0,15	-0,22	-0,02	0,30	-0,28	0,48	-0,55
BNGA	0,42	-0,17	0,05	0,60	-0,19	-1,72	-0,27	0,04	-0,38	-0,61	0,17	-0,37	-0,56	-0,56	-0,10	0,42	-0,54	-0,68	0,46	-0,49
BDMN	0,40	-0,19	0,77	3,36	-0,19	-0,46	-0,32	-0,95	-0,01	-0,65	0,18	-0,38	-1,01	-0,40	-0,61	0,92	-1,83	-0,93	0,63	0,66
BNII	-0,21	4,97	-1,02	-1,50	-0,19	0,64	-0,25	0,68	0,15	-0,92	0,45	-0,35	-0,30	0,01	-0,65	1,60	0,65	-0,97	-0,97	-0,57
BKSW	-0,21	-0,22	0,16	-0,20	-0,19	-0,70	-0,21	2,07	3,44	4,02	0,04	-0,35	1,89	4,49	3,57	-0,43	-1,25	0,26	1,51	2,45
MAYA	-0,21	-0,22	0,16	-0,20	-0,19	0,23	0,02	1,35	0,76	0,77	0,00	-0,30	0,87	0,66	1,69	1,52	2,26	-1,60	1,63	-0,31
MEGA	0,62	-0,22	-0,98	-1,81	-0,19	0,37	-0,06	-0,14	-0,20	-0,63	0,28	-0,33	-2,18	-0,42	-0,18	-0,68	0,13	-0,95	0,87	0,45
BCIC	-0,21	-0,22	0,16	-0,20	-0,19	1,28	-0,07	-0,11	-1,03	-0,80	0,82	-0,20	-0,28	-1,12	-2,25	0,72	-0,29	0,58	-0,62	-0,83
BBNP	-0,21	-0,22	0,16	-0,20	-0,19	0,92	-0,14	-0,22	0,40	-0,77	0,70	-0,34	-0,14	-0,19	-1,04	-1,06	0,81	0,79	-0,82	-0,25
NISP	-0,21	-0,22	0,16	-0,20	-0,19	-0,15	-0,27	2,14	0,61	-0,36	0,39	-0,34	0,16	-0,16	-0,43	-1,37	0,62	0,39	-0,83	-0,20
PNBN	4,49	-0,23	0,25	0,55	-0,19	0,28	-0,38	-0,47	-0,03	0,12	0,60	-0,36	0,42	-0,45	-0,33	0,42	-0,54	-0,68	0,46	-0,49
BNLI	-0,04	-0,25	-2,44	-0,20	-0,19	-1,97	0,13	0,44	0,78	-0,38	-0,30	3,40	0,63	-0,12	-0,51	0,92	-1,83	-0,93	0,63	0,66
BSIM	-0,21	-0,22	0,16	-0,20	-0,19	0,84	0,16	-2,77	-1,07	1,71	0,32	-0,29	-1,27	-0,67	0,79	1,60	0,65	-0,97	-0,97	-0,57
BSWD	-0,21	-0,22	0,16	-0,20	-0,19	-0,91	0,08	0,19	0,49	0,49	-0,33	-0,33	0,22	0,47	0,40	-0,43	-1,25	0,26	1,51	2,45
BEKS	-0,21	-0,22	0,16	-0,20	-0,19	-1,77	4,88	0,48	-0,20	-0,81	-2,56	2,14	1,93	-0,12	-0,88	1,52	2,26	-1,60	1,63	-0,31
BTPN	-0,21	-0,22	0,16	-0,20	-0,19	0,66	0,18	-0,39	-0,25	-0,82	0,89	-0,34	0,28	-0,24	-0,12	-0,68	0,13	-0,95	0,87	0,45
BVIC	-0,21	-0,22	0,16	-0,20	-0,19	1,72	-0,38	0,13	0,25	-0,19	-0,06	-0,22	0,62	0,75	-0,22	0,72	-0,29	0,58	-0,62	-0,83
BACA	-0,21	-0,22	0,16	-0,20	-0,19	1,58	-0,45	-0,80	1,13	0,24	0,94	-0,43	1,99	0,24	0,60	-1,06	0,81	0,79	-0,82	-0,25
MCOR	-0,21	-0,22	0,16	-0,20	-0,19	1,17	0,30	-0,96	0,05	0,24	2,01	-0,27	-1,43	-0,12	0,54	-1,37	0,62	0,39	-0,83	-0,20

Source : Researcher

Appendix 2

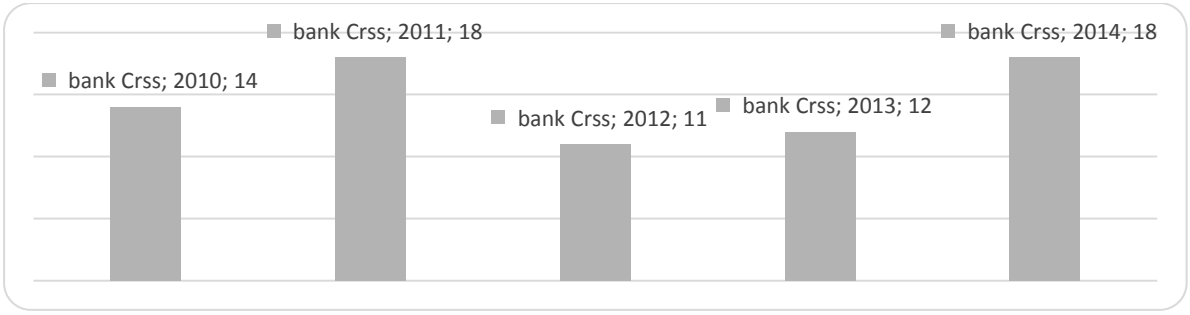
Table 2. The CD Index* Score Each Bank

	CD Index category crisis and uncrisis					Main Score of CD Index				
	2010	2011	2012	2013	2014	2.010	2.011	2.012	2.013	2.014
BMRI	0	1	0	0	1	0,38	-0,30	0,02	0,21	-0,12
BBNI	1	1	0	0	1	-0,24	-0,26	0,24	0,08	-0,24
BBRI	1	1	0	1	1	-0,22	-0,19	0,30	-0,48	-0,27
BBTN	1	0	0	1	1	-1,15	0,61	0,77	-0,39	-0,55
AGRO	1	1	0	1	0	-0,74	-0,23	0,32	-0,51	0,28
INPC	1	1	0	1	1	-0,40	-0,16	0,16	-0,77	-0,37
BKPN	1	1	0	1	0	-0,06	-0,50	0,54	-0,71	0,44
BABP	1	1	1	0	1	-0,27	-0,40	-0,22	0,02	-0,07
BBCA	1	0	1	0	0	-0,55	0,01	-0,84	0,22	1,10
BNGA	1	1	1	0	1	-0,18	-0,34	-0,29	0,03	-0,35
BDMN	0	1	1	0	1	0,26	-0,68	-0,53	0,89	-0,20
BNII	0	0	1	1	1	0,62	1,25	-0,40	-0,58	-0,58
BKSW	1	1	0	0	0	-0,32	-0,51	1,09	2,31	2,46
MAYA	0	0	0	0	0	0,39	0,44	0,20	0,72	0,49
MEGA	0	1	1	1	1	0,15	-0,12	-1,06	-0,39	-0,14
BCIC	0	1	0	1	1	0,66	-0,19	0,09	-0,74	-1,02
BBNP	0	0	0	1	1	0,09	0,03	0,15	-0,20	-0,56
NISP	1	1	0	1	1	-0,34	-0,05	0,71	-0,15	-0,30
PNBN	0	1	1	0	1	1,45	-0,38	-0,12	0,13	-0,23
BNLI	1	0	1	0	1	-0,35	0,36	-0,58	0,27	-0,11
BSIM	0	0	1	1	0	0,64	0,07	-1,21	-0,73	0,44
BSWD	1	1	0	0	0	-0,47	-0,43	0,21	0,57	0,79
BEKS	1	0	0	0	1	-0,76	2,27	0,24	0,28	-0,55
BTPN	0	1	1	0	1	0,17	-0,06	-0,22	0,04	-0,17
BVIC	0	1	0	0	1	0,54	-0,28	0,37	0,05	-0,36
BACA	0	1	0	0	0	0,31	-0,07	0,53	0,09	0,10
MCOR	0	0	1	1	0	0,40	0,11	-0,46	-0,28	0,10

*The fullfilment CD Index there are if CDI score ≤ 0 or negatif it will fill 1 as the meaning posibility crisis and if CDI score >0 or positive value it meaning crisis not happen or bank has recover from crisis.

Source : Researcher

Appendix 3



Source : researcher

Figure 1. Amount of Bank Crisis

Table 3. Rank of Probability Crisis Each Periods

Rank	2010		2011		2012		2013		2014	
1	**BBTN**	-1,15	**BDMN**	-0,68	**BSIM**	-1,21	**INPC**	-0,77	**BCIC**	-1,02
2	**BEKS**	-0,76	**BKSW**	-0,51	**MEGA**	-1,06	**BCIC**	-0,74	**BNII**	-0,58
3	**AGRO**	-0,74	**BKPN**	-0,50	**BBCA**	-0,84	**BSIM**	-0,73	**BBNP**	-0,56
4	**BBCA**	-0,55	**BSWD**	-0,43	**BNLI**	-0,58	**BKPN**	-0,71	**BBTN**	-0,55
5	**BSWD**	-0,47	**BABP**	-0,40	**BDMN**	-0,53	**BNII**	-0,58	**BEKS**	-0,55
6	**INPC**	-0,40	**PNBN**	-0,38	**MCOR**	-0,46	**AGRO**	-0,51	**INPC**	-0,37
7	**BNLI**	-0,35	**BNGA**	-0,34	**BNII**	-0,40	**BBRI**	-0,48	**BVIC**	-0,36
8	**NISP**	-0,34	**BMRI**	-0,30	**BNGA**	-0,29	**MEGA**	-0,39	**BNGA**	-0,35
9	**BKSW**	-0,32	**BVIC**	-0,28	**BTPN**	-0,22	**BBTN**	-0,39	**NISP**	-0,30
10	**BABP**	-0,27	**BBNI**	-0,26	**BABP**	-0,22	**MCOR**	-0,28	**BBRI**	-0,27
11	**BBNI**	-0,24	**AGRO**	-0,23	**PNBN**	-0,12	**BBNP**	-0,20	**BBNI**	-0,24
12	**BBRI**	-0,22	**BCIC**	-0,19	**BMRI**	0,02	**NISP**	-0,15	**PNBN**	-0,23
13	**BNGA**	-0,18	**BBRI**	-0,19	**BCIC**	0,09	**BABP**	0,02	**BDMN**	-0,20
14	**BKPN**	-0,06	**INPC**	-0,16	**BBNP**	0,15	**BNGA**	0,03	**BTPN**	-0,17
15	**BBNP**	0,09	**MEGA**	-0,12	**INPC**	0,16	**BTPN**	0,04	**MEGA**	-0,14
16	**MEGA**	0,15	**BACA**	-0,07	**MAYA**	0,20	**BVIC**	0,05	**BMRI**	-0,12
17	**BTPN**	0,17	**BTPN**	-0,06	**BSWD**	0,21	**BBNI**	0,08	**BNLI**	-0,11
18	**BDMN**	0,26	**NISP**	-0,05	**BBNI**	0,24	**BACA**	0,09	**BABP**	-0,07
19	**BACA**	0,31	**BBCA**	0,01	**BEKS**	0,24	**PNBN**	0,13	**MCOR**	0,10
20	**BMRI**	0,38	**BBNP**	0,03	**BBRI**	0,30	**BMRI**	0,21	**BACA**	0,10
21	**MAYA**	0,39	**BSIM**	0,07	**AGRO**	0,32	**BBCA**	0,22	**AGRO**	0,28
22	**MCOR**	0,40	**MCOR**	0,11	**BVIC**	0,37	**BNLI**	0,27	**BSIM**	0,44
23	**BVIC**	0,54	**BNLI**	0,36	**BACA**	0,53	**BEKS**	0,28	**BKPN**	0,44
24	**BNII**	0,62	**MAYA**	0,44	**BKPN**	0,54	**BSWD**	0,57	**MAYA**	0,49
25	**BSIM**	0,64	**BBTN**	0,61	**NISP**	0,71	**MAYA**	0,72	**BSWD**	0,79
26	**BCIC**	0,66	**BNII**	1,25	**BBTN**	0,77	**BDMN**	0,89	**BBCA**	1,10
27	**PNBN**	1,45	**BEKS**	2,27	**BKSW**	1,09	**BKSW**	2,31	**BKSW**	2,46

Source **:** Researcher

Appendix 5

Table 4. Sample of research

MEGA	Mega	BMRI	Bank Mandiri
BCIC	J Trust or Century Bank	BBNI	Bank BNI
BBNP	Nusantara Parahyangan	BBRI	Bank BRI
NISP	OCBP NISP	BBTN	Bank BTN
PNBN	Pan Indonesia	AGRO	Bank BRI Agroniaga
BNLI	Permata	INPC	Artha Graha Internasional
BSIM	Sinarmas	BKPN	Bukopin
BSWD	Bank Of India Indonesia	BABP	MNC
BEKS	Bank Pundi Indonesia	BBCA	Bank Central Asia
BTPN	Bank Tabungan Pensisunan Negara	BNGA	CIMB Niaga
BVIC	Victoria	BDMN	Danamon
BACA	Capital	BNII	Maybank Indonesia
MCOR	Windu	BKSW	QnB Kesawan