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## Measurement of the Financial Portfolio Volatility of Sharia Commercial Banks by Cardona Method

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### **Abstract**

The purpose of this research: (1) to know and to analyze the extent of the volatility of sharia banking industry in indonesia in facing the competition; (2) to know and to analyze the factors that affect the volatility of sharia banks; (3) to know and to analyze the extent to which the continuity of the sharia banking industry development towards Indonesia's economic development. The research was conducted to measure the volatility of sharia bank portfolio using 2015 observation period, and the data used is cross section data. As for the research design used is quantitative research, using asset dimension (asset portfolio, liability portfolio, equity portfolio) and stressor (pressure, including credit risk, market risk, and liquidity risk). The activity plan of this research are: in the early stages, conducting theoretical studies related to the volatility that is associated with banking especially sharia bank; the next step is to determine the asset dimensions and stressor associated with the sharia bank; then determine the indicators related to assets and stressors; the next step is performs calculations to determine the index of each sharia banks as well as the dimensions that affect the vulnerabilities faced by each sharia banks. The expected target achievement that can be generated from this research are: For the research object (sharia banks), to provide a solution for sharia banks to deal with and overcome the vulnerabilities faced and policies that must be done. For policy makers, the results of this study are expected to provide a suggestion in decision-making and other policies. Measurement of volatility to be performed is related to banking operations in facing the competition and the continuity of sharia banks in Indonesia. The outcomes of this study is expected to be included in the journal of Bank Indonesia, the selection of this journal is based on studies conducted in the banking sector, especially sharia bank in Indonesia.

**Keywords:** volatility, assets, stressor, cardona

### **Abstrak**

*Penelitian ini bertujuan: (1) untuk mengetahui dan menganalisis sejauhmana volatilitas (kerentanan) industri perbankan syariah di Indonesia dalam menghadapi persaingan (2) untuk mengetahui dan menganalisis faktor-faktor yang mempengaruhi kerentanan bank umum syariah; (3) untuk mengetahui dan menganalisis sejauhmana kesinambungan perkembangan industri perbankan syariah terhadap pembangunan ekonomi Indonesia. Penelitian yang dilakukan untuk mengukur kerentanan (volatilitas) proto folio bank umum syariah menggunakan periode waktu pengamatan 2015, dan data yang dipergunakan adalah data cross section. Adapun design penelitian yang dipergunakan dalam penelitian adalah penelitian kuantitatif, dengan menggunakan dimensi asset (portofolio asset, portofolio liabilitas, portofolio ekuitas) dan stressor (tekanan, meliputi: risiko kredit, risiko pasar, dan risiko likuiditas). Adapun rencana kegiatan dari penelitian ini adalah : pada tahap awal melakukan telaah teori yang berkaitan dengan kerentanan yang berkaitan dengan perbankan khususnya BUS; tahap berikutnya adalah menentukan dimensi asset dan stressor yang berkaitan dengan BUS; selanjutnya menentukan indikator terkait dengan asset dan stressor; langkah berikutnya melakukan perhitungan untuk menentukan index masing-masing BUS serta dimensi yang mempengaruhi kerentanan yang dihadapi setiap BUS. Target capaian yang diharapkan bisa dihasilkan dari penelitian ini adalah : untuk objek penelitian (BUS) memberikan solusi bagi BUS untuk menghadapi dan mengatasi kerentanan yang dihadapi serta kebijakan yang harus dilakukan. Bagi pengambil kebijakan, hasil kajian ini diharapkan dapat memberikan masukan dalam pengambilan keputusan serta kebijakan lainnya. Pengukuran kerentanan yang akan dilakukan berkaitan dengan operasional perbankan dalam menghadapi persaingan serta kesinambungan BUS di Indonesia. Hasil (outcome) dari kajian ini diharapkan dapat masuk dalam jurnal Bank Indonesia, pemilihan jurnal ini didasarkan pada kajian yang dilakukan pada sektor perbankan khususnya BUS di Indonesia.*

**Kata Kunci:** kerentanan, asset, stressor, cardona

**1. Introduction**

The phenomenon of the development in sharia banking industry in many countries in the world is a condition that many countries have been wanting to do. The existence of sharia banking industry that has been awaited by many countries, increasingly provide fresh air for the growth and development the industry. The development of sharia banking industry in Indonesia, providing an alternative banking service and equip the current existing banking.

Aligned with Indonesian Banking Architecture, the presence of sharia banking industry together with the conventional banking industry synergize to support the achievement of economic development through public fundraising. In the development of sharia banking industry, which began in Indonesia since 2010 according to the law of the Republic of Indonesia (UU RI) No. 21 of 2008 has a strong legal foundation in its implementation in Indonesia.

The contribution of the banking sector in the Indonesian economy, from time to time continues to increase. This increase in contribution indicates that the role of the banking sector in development as an intermediary insti-

tution between the surplus of fund parties and the deficit of funds parties is very important. As for the contribution of the banking sector in the Indonesian economy over a period of time can be seen in Table 1.

Meanwhile, the development of the banking sector in Indonesia, both conventional and sharia banks complement one other, in accordance with the Indonesian banking architecture. The development of both conventional and sharia banking sectors can be seen in Table 2.

From Table 2 shown, for banking business activities during 2011 to June 2015, commercial banks are dominant in channeling funds, sources of funds and number of bank offices. However, in terms of the number of banks, there are many rural banks. This shows that commercial banks still dominate banking activities in Indonesia, while rural banks are only able to operate in small areas which commercial banks do not/ have not reached.

Institutionally based on Sharia Banking Statistics, by Financial Services Authority in June 2015, the development of sharia in Indonesia during the period of 2009 to 2014 shows a fairly good development. Sharia banks from 6 banks in 2009 to 12 banks in 2014. Whereas for Sharia Business Unit from 25 units in 2009 to 22 units in

**Table 1.** GDP Based of Current Prices by Business Field (Billion Rupiah), 2010-2014

La pangan Usaha	2010	2011	2012	2013*	2014**
<b>1. PERTANIAN, PETERNAKAN, KEHUTANAN DAN PERIKANAN</b>	985,470.50	1,091,447.10	1,193,452.90	1,310,427.30	1,446,722.30
<b>2. PERTAMBANGAN DAN PENGGALIAN</b>	719,710.10	876,983.80	972,458.40	1,026,297.00	1,058,750.20
<b>3. INDUSTRI PENGOLAHAN</b>	1,599,073.10	1,806,140.50	1,972,523.60	2,152,802.80	2,394,004.90
<b>4. LISTRIK, GAS, DAN AIR BERSIH</b>	49,119.00	55,882.30	62,271.60	70,339.60	81,131.00
<b>5. B A N G U N A N</b>	660,890.50	753,554.60	844,090.90	907,267.00	1,014,540.80
<b>6. PERDAGANGAN, HOTEL DAN RESTORAN</b>	882,487.20	1,023,724.80	1,148,791.00	1,301,175.00	1,473,559.70
<b>7. PENGANGKUTAN DAN KOMUNIKASI</b>	423,172.20	491,287.00	549,105.40	635,302.90	745,648.20
<b>8. KEUANGAN, PERSEWAAN &amp; JASA PERSH.</b>	466,563.80	535,152.90	598,433.30	682,973.20	771,961.50
<b>9. JASA - JASA</b>	660,365.50	785,014.10	889,798.80	1,000,691.70	1,108,610.30
<b>PRODUK DOMESTIK BRUTO</b>	<b>6,446,851.90</b>	<b>7,419,187.10</b>	<b>8,230,925.90</b>	<b>9,087,276.50</b>	<b>10,094,928.90</b>
<b>PRODUK DOMESTIK BRUTO TANPA MIGAS</b>	<b>5,941,951.90</b>	<b>6,795,885.60</b>	<b>7,589,809.00</b>	<b>8,419,133.90</b>	<b>9,391,537.30</b>

Source: BPS, 2015

**Table 2.** Banking Business Activities

Indikator	2011	2012	2013	2014	Juni 2015
<b>Penyaluran Dana</b>					
Bank Umum	3,412,463	4,172,672	4,823,303	5,468,909.80	5,821,497.84
Bank Perkreditan Rakyat	53,534	64,753	74,550	86,931.20	90,703.20
SBI dan SBIS <sup>1)</sup>	117,983	81,158	111,889	113,104.18	63,141.67
<b>Sumber Dana</b>					
Bank Umum	3,093,848	3,542,518	4,070,018	4,594,875.82	4,853,864.28
Bank Perkreditan Rakyat	45,462	55,289	64,001	74,593.57	78,506.74
<b>Jumlah Aset</b>					
Bank Umum	3,652,832	4,262,587	4,954,467	5,615,149.82	5,933,195.10
Bank Perkreditan Rakyat	55,799	67,397	77,376	89,878.38	93,987.34
<b>Jumlah Bank</b>					
Bank Umum	120	120	120	119.00	118.00
Bank Perkreditan Rakyat	1,669	1,653	1,635	1,643.00	1,644.00
<b>Jumlah Kantor</b>					
Bank Umum	14,797	16,625	18,558	19,948.00	20,247.00
Bank Perkreditan Rakyat	4,172	4,425	4,678	4,895.00	5,019.00

Ket: <sup>1)</sup> Sertifikat Bank Indonesia

Source : OJK , 2015

2014 (decreased), and for BPRS from 139 BPRS in 2009 to 161 BPRS in 2015.

Based on data from the Financial Services Authority of 2015, the growth of Syariah Commercial Banks and Sharia Business Units in Indonesia for some time since the enactment of the law shows quite encouraging developments in terms of assets, financing, third party funds, FDR and NPF. The average assets of Syariah Commercial Banks and Sharia Business Units during 2015 averaged 10974.18 billion, with an average financing of 17887.16 billion, while third party funds averaged 6472.67 billion, with an average FDR of 130.36% and NPF averaged 5.72%.

Along with the existence of sharia banking in Indonesia, the absorption of labor for this sector has increased from time to time. The development of labor absorption in sharia commercial banks and sharia business units can be seen in the table 3.

Based on the background describe above, from the various problems that exist, the focus of the problem of this study are: (1) The extent of the volatility of sharia banking industry in Indonesia in facing the competition (2) The extent to which the continuity of the sharia banking industry development and contribution towards Indonesia's economic development.

While the benefits of this research are: (1) For academics, this research will provide knowledge about the volatility occurring in Sharia Commercial Banks in Indonesia. (2) For practitioners, the results of this research will provide information to the bank about the factors causing the volatility of Sharia Commercial Banks in Indonesia. (3) For regulators, the results of this study can be a suggestion to determine the policy that will be taken related potential vulnerabilities of Sharia Commercial Banks in Indonesia. (4) For the writer, this research can add knowledge and insight and can apply and socialize the theory that has been obtained to contribute to the development of science, especially the economy of sharia.

## 2. Theoretical Framework and Hypothesis Development

### Sharia Bank

Since the early 1990s, Indonesians have begun to

recognize alternative concepts of conventional banking systems that have existed before. This concept is the embodiment of efforts to meet the needs of Muslims against the financial system, especially banks in accordance with Islamic Shari'a, namely Islamic banks or banks that operate on the basis of the principles of Islamic Shari'a.

The fundamental difference between an Islamic bank and a conventional bank lies in the business relationship between the bank and its customers. The Bank in Law of 1998 has the role of a financial intermediary institution between the surplus of fund parties and the deficit of funds parties as well as the role of transfer of purchasing power from community groups with high purchasing power to people with low purchasing power.

Islam teaches its people to forbid usury transactions, transactions that contain *maysir* and *gharar*, on the contrary Islam encourages its people to always be fair, honest and not mutually tyrannize. *Muamalah* relationship (business) between human beings as intended is set in *aqad* (contract).

### Aqad on The Liability Side

There are two types of *aqad* which regulate the relationship between the bank and depositors namely deposit *aqad* and investment *aqad*. In deposit *aqad* (*wadiah*), customers act as the party who entrusts his property with the aim of obtaining a sense of security, not lavishly looted and get the ease of settling business relationships with others. While the bank acts as the recipient of the deposit, must be trustworthy and bear the risk of the integrity of goods/property deposited to the bank.

There are two types of deposit *aqad* namely *wadiah yad amanah*, the bank purely as the party receiving the deposit, keep the goods deposited well and return it when asked by the party who entrusted, while the second type is *wadiah yad adh dhamanah*, the bank other than as the entrusted party, banks are also permitted to use the deposit to gain profit, providing that the principle of security of the party who entrusted the deposit is maintained. In this *aqad* the bank as an entrusted party is not obliged to pay anything, on the contrary banks are entitled to withdraw the cost of deposit services. Especially for *yad adh dhamanah*, banks may put aside the profits gained on the used of deposit funds to be distributed to customers as bonuses that are not promised.

Table 3. Number of Workers in Sharia Banking

Indikator	2009	2010	2011	2012	2013	2014	2015
						Des	Juni <sup>*)</sup>
Bank Umum Syariah	10,348	15,224	21,820	24,111	26,717	41,393	38,307
Unit Usaha Syariah	2,296	1,868	2,067	3,108	11,511	4,425	4,414
Bank Pembiayaan Rakyat Syariah	2,799	3,172	3,773	4,359	4,826	4,704	4,808

r) Angka-angka diperbaiki

\*) Angka-angka sementara

1. "Revisi data BUS-UUS mulai bulan Mei 2014 berdasarkan LSMK"

The other type of *aqad* is *syirkah*, which is based on investment *aqad* (fellowship) or partnership. In this type, depositors act as investors who invest their excess funds in order to gain profit and of course participate in bearing losses in the event of a loss. Whilst the bank acts as a fund manager who is obliged to invest customer funds in various forms of business that is lawful and profitable.

Deposit *aqad* is generally used to regulate the relationship between banks and depositors in demand deposit and savings products. While investment *aqad* is used to regulate the relationship between banks and depositors in deposit products. There are two deposit products that use this *shirkah aqad* namely general investment account (GIA) which is regulated by *syirkah mudharabah mutlaqah aqad* and special investment account (SIA) regulated by *syirkah mudharabah muqqayadah aqad*.

The consequences of the application of these *wadiah aqad* and *syirkah aqad* is sharia bank does not give reward in the form of interest in which the amount has been agreed at the beginning of the contract. In a conventional bank, the depositors' basic intentions in opening a relationship with the bank are not distinguished as the party who entrusted or the investor, then on the contrary in sharia banks both of these basic intentions treatment are differentiated, as well as their rights and responsibilities are clear. Savers and holders of demand deposits as the party who entrusted are protected against the risk of loss but have no right to remuneration, while the owner of the deposit as an investor is entitled to the profit earned by the bank but participates to bear the losses incurred from an investment activity. The profit of an investor is determined depending on the profits earned by the bank as well as the revenue-sharing agreement between the two at the start of the contract.

### **Aqad on The Asset Side**

On the asset side, There are at least four types of *aqad* that regulate the relationship between the sharia bank with its debtor i.e 1) *syirkah aqad* (fellowship), 2) *tijarah aqad* (trade), 3) *ijarah aqad* (rent) dan 4) *qard aqad* (loan). Sharia banks, with funds collected either as deposits or investments can then be used to help debtors finance their businesses in diverse ways, i.e.; build a profit-sharing partnership with the debtor, provide the needed goods and services and sell it to the debtor who needs it, provide the goods and lease them to the debtor for a specified period of time or lend the funds to the debtor without return.

In the *syirkah aqad*, the bank partners with customers in the capital of a business or project. Under the *syirkah mudharabah aqad*, the bank meet all the needs of debtor's capital and share the return of the debtor project's profit, whilst under *syirkah al inan aqad*, the bank fulfill some of the capital needed for the business or project of the debtor and the rest is fulfilled by the debtor himself. Both parties agreed to share the benefits of the project.

In *bai ' aqad* (trade) the bank acts as the party holding the goods and services and sells it in addition (margin) of profit to the debtor who needs it. The bank may pro-

vide goods by purchasing the goods that debtor desired (*bai 'al murabaha*), by ordering the goods first and deliver when it finished (*bai 'as salaam*) or deliver gradually (*bai 'al istishna*). Profit margins are mutually agreed at the beginning and valid throughout the contract period. The debtor may accelerate payment by obtaining remission (discount). The bank gain profits from the margin or the difference between the purchase price of the goods from the supplier and the selling price to the debtor.

In *ijarah aqad* (rent) the bank acts as a leasing and debtor as a tenant. The bank as the lessor provides the goods and leases it to the customer for a certain period of time. When in *bai ' aqad* the bank sells ownership of the goods, then in *aqad ijarah* the bank sells the benefits of the goods only while the ownership remains with the bank unless otherwise requested (*ijarah muntahiya bit tamlik aqad*). Because the bank does not necessarily require such goods, the bank may provide an option to the debtor so that at the end of the lease period the debtor may own the good either by purchasing at a specified price or simply granted. The bank gain profits from the rent fee (*ujrah*).

In *qard aqad*, the bank acts as a lender of its funds to the debtor without interest and only burden the debtor with administrative fees. This *aqad* is usually used when the conventional bank debtors want to become a sharia bank debtors by transferring the credit obtained in conventional banks to sharia banks.

The consequence from the application of these four types of *aqad* is that sharia banks will receive profit in the form of income on financing which is given in two forms; 1) income on sale-purchase profit margins and rental income (*ujrah*) both of which are fixed (not volatile) and predictable, 2) income on the profit portion of the customer's business/project that is not fixed (fluctuate) and less predictable. This nature of income is what causes the Islamic banks in Indonesia more likely to use *tijarah* and *ijarah aqad* to channeling funds rather than *syirkah aqad*, in order to avoid the risk of return.

### **Sharia Money Market**

In conventional systems known as the money market where a bank or a financial institution sells money between parties in need of funds and those with an excess of funds. Parties who need funds can buy money at a certain price level (demand side) and those with excess funds may sell at a certain price level (supply side). At this time imposed the law of supply and demand.

Not with the sharia bank, the prohibition of usury including to sell money (in the same currency) with any purpose. Therefore the concept of sharia money market is different from conventional money market concept. Money exchange must be based on asset transactions (asset based transaction). Sharia banks get their cash needs on the basis of project financing or asset procurement financing with a clear profit projection.

Sharia bank money market is not as flexible as conventional banks. Therefore sharia banks must manage their

liquidity cautiously. Sharia banks that require funds can also issue *sukuk* or sharia bonds. The principle remains the same as the sharia money market mechanism. *Sukuk* is issued not as a bond but a certificate of ownership and as owner shall be entitled to a share of profit or income of the project financed by the *sukuk* fund.

### Risk of Sharia Bank

Sharia banks, as well as conventional banks are also exposed to various types of risks in their business with the levels of risk different with the level of risk faced by conventional banks. Some of the major risks of sharia banks are:

1. Credit Risk, the potential loss caused by the non-return of principal loan that has been distributed to the public (debtors). The credit risk indicator is the ratio between the number of non-performing financing to the total financing, commonly called the NPF (Non Performing Financing) ratio.
2. Liquidity Risk, the potential losses incurred by the bank's failure to recover its short-term liabilities. Indicator of liquidity risk is the ratio between the amount of funds channeled in the form of financing to the amount of public funds that have been collected, commonly called FDR (Financing Deposits Ratio).
3. Market Risk, the potential losses incurred by fluctuations in exchange rates and interest rates. There are several indicators of market risk and indicators that will be used in this study is the ratio of NOP (Net Open Position).

### Distribution of Profit Sharing

Due to differences in the relationship between bank and customer in sharia bank with the conventional bank, there is also the difference in the form and mechanism of earning return, whether it is a reward for sharia bank or for sharia bank depositors.

On the receiving side, sharia banks gain the return for the funds that distributed in three forms of income, i.e.; a) income sharing from debtor's business that obtains *syirkah*-based financing that has fluctuating characteristics in accordance with the realization of the business performance of the debtor b) profit margins on trading transactions conducted by sharia banks with their customers which are fixed within the *aqad* period and c) fee income for services provided by sharia banks either derived from leasing assets, as well as from the provision of financial services such as conventional banks in general, i.e. the issuance of L/C, Bank Guarantee, Clearing & Collection, Safe Deposits Box, Standing Order and so forth.

On the side of expenditure, sharia banks pay the compensation for the funds collected in two forms; a) profit sharing for *syirkah*-based deposit customers that is fluctuating depends on the realization of sharia bank business performance and b) rewards for customers who deposit their funds in demand deposits and savings based on *wa-*

*diah* that is not promised and in accordance with the ability of the bank and will be paid after the share of profit sharing is distributed.

### Sharia Bank Stability System

There are two points of view on profit-sharing system stability (profit and loss sharing). As in Cihak & Hesse (2008) research, some researcher for example Choong and Liu (2006) in Cihak & Hesse (2008) assume that the sharia banking system, especially in Malaysia, does not show the similarity as a bank with a profit-sharing system so that in financial analysis, sharia banks should be treated the same as conventional banks, while other researchers (for the most part) consider sharia banks to be at higher risk than conventional banks.

Sundrarajan and Errico (2002), Iqbal and Llewellyn (2002) and World Bank and IMF (2005), each of them in Cihak and Hesse (2008) noted that 1) the profit-sharing system not only shifts the credit risk directly from the bank to depositors (specifically profit-sharing deposits) but also increases the risk of all components of sharia bank assets, 2) operational risks in which there is a risk of compliance with Sharia provision, 3) the profit-sharing system can not make the sharia bank rely on warrant and collateral in reducing the credit risk as commonly found in conventional banks, 4) standardization of products in sharia banks is more difficult related to likely financing methods, increased in operational risks, and legal uncertainty in interpreting *aqad*, 5) sharia banks have fewer techniques and hedging instruments than conventional banks and sharia banks operate traditionally in an environment where there is no or less developed sharia money market and state securities. Although the latest developments in the money market and sharia instruments have improved, 6) although the non-profit sharing financing in sharia banks (e.g *tijarah*) is less risky but has a number of other risks that still need to be well recognized, 7) there is a risk that is specifically inherent to sharia banks that are rooted in the nature of *mudharabah* deposits (investment deposits) where the value of capital and investment rate of return is not guaranteed thus potentially to create moral hazard and increase incentives to take risks and operate sharia banks without sufficient capital.

Guarantee scheme by LPS applicable to Indonesian banking has included providing security of principal investment for investors or *mudharabah* deposits customers, so that point 7) particularly the value of capital is not applicable. Besides, the profit-sharing pattern in the sharia bank in Indonesia is not purely profit-sharing (profit/loss) but is for income (revenue sharing). Whereas the guarantee on the investment rate of return is indeed a characteristic of *syirkah aqad* which puts the parties to bear the risk and profit.

The linkage between the development of the financial sector and economic growth has been the object of research in a variety of development and financial economics literature. The issue of finance and growth has been raised at least since the 19th century by Joseph A. Schumpeter (1912) in Yotopolus (1997) which expressed the urgency of the banking system and the growth of the

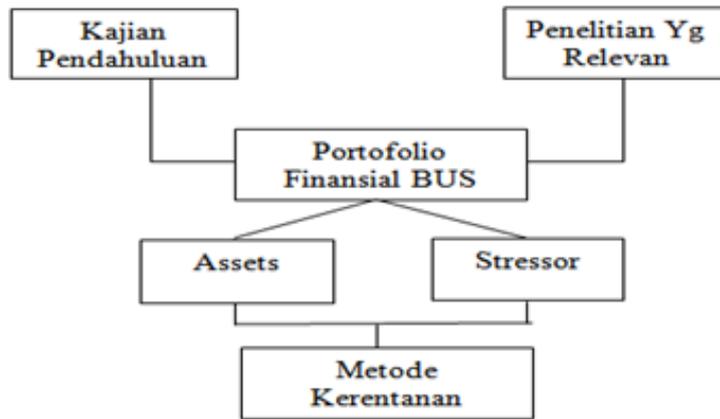


Figure 1. Research Roadmap of Volatility Methods

national income level in economic development through the identification and financing of productive investment sectors.

There are at least four possible approaches that could explain the causal relationship between finance and growth, ie: 1) Finance is the determining factor of economic growth (finance-led growth hypothesis) or so called “supply-leading view”, 2) Finance follows economic growth (growth-led finance hypothesis) or so called “demand-following view”, 3) Mutual affect relationship between finance and growth or so called “the bidirectional causality view”, and 4) finance and growth are not interconnected or commonly called “the independent hypothesis.”

The Cardona volatility index measurement model is a volatility measurement model that uses two components, assets and stressor. Cardona model with these two components is tried to be applied to the measurement of sharia banking volatility in Indonesia. In terms of assets owned by Sharia Commercial Bank: Asset Portfolio, Portfolio of Liabilities and Equity Portfolio. Whilst in terms of stressor faced by sharia commercial bank: Credit Risk, Market Risk, and Financial Risk.

**3. Research Method**

The research is planned to begin by conducting a literature review of theoretical concepts and relevant research results. The result of the study became the basis for disclosing the problems faced by Sharia Commercial Bank, specifically in overcome the risks faced mainly from the financial portfolio side. To explore the problem, field observation with actual data in each sharia bank will be performed. Preliminary data will be collected to illustrate the dimensions relevant to the volatility problem. The results in this step form the method of measuring the sharia bank’s volatility index by mathematical methods and analytical methods.

Based on the theoretical method of measuring the volatility, step of analysis and grouping the banks will be conducted. In this stage, the data of survey and observation results will be analyzed and index calculation, a set of trial will be conducted on determining the volatility index. The desired result is a model that can measure and classify the volatility of sharia banks that can be applied

in sharia banking in particular and other commercial banks.

The data used in the analysis of this research is the Quarterly Financial Statement Data of Sharia Commercial Banks in Indonesia during the period of 2015. Based on the source, this study uses secondary data, is a data that obtained from the Financial Statement information of twelve (12) Sharia Banks, i.e: Bank Muamalat Indonesia Inc., Bank Victoria Syariah Inc., Bank BRI Syariah, B.P.D. Jawa Barat Banten Syariah, Bank BNI Syariah, Bank Syariah Mandiri (BSM), Bank Syariah Mega Indonesia, Bank Panin Syariah, Bank Syariah Bukopin Inc., BCA Syariah Inc., Maybank Syariah Indonesia Inc., Bank Tabungan Pensiunan Nasional Syariah Inc., during the period of 2014. The data obtained is taken directly on each sharia bank. This is because the data needs to be verified by each of the Sharia Banks so that the data used in this study proves to be valid. So the results of this study are expected to be proven in accordance with reality and can be taken into consideration in calculating and improving the performance of sharia banks in the future.

The method of analysis used in this research is quantitative and qualitative methods. Quantitative data analysis is a form of analysis which uses numbers and calculations using the Cardona index method, whereas the qualitative method is a description of the quantitative method, using the Excel program.

The dimensions, criteria, and indicators used to measure the susceptibility of sharia banks with the components of Assets and Stressor can be seen in Table 4.

The stages of sharia banks volatility index calculation as follows :

- 1) Perform data verification and validation of each indicator, then input data into the database system that has been prepared
- 2) The result of the data input for each indicator will be normalized in order to have the same unit. The normalization formula as follows:

$$NIX_{in} = \frac{NIX_i - NIX_{i-min}}{NIX_{i-max} - NIX_{i-min}}$$

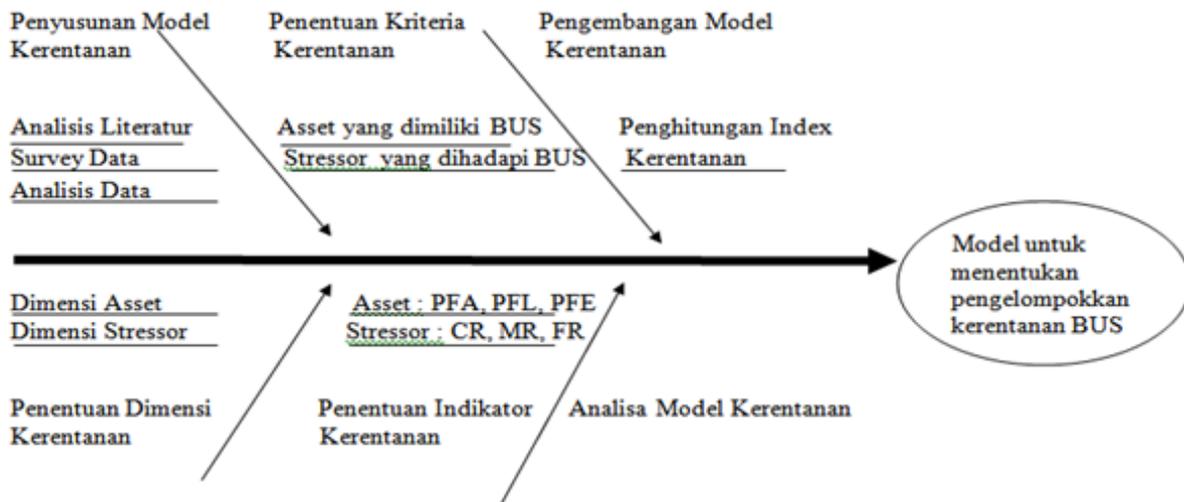


Figure 2. Fishbone Flow Research That Describes The Entire Series of Research

- 3) From the results of normalization performed on each X indicator, then the average value of all indicators for each aspect group is calculated on each Sharia Bank
- 4) Furthermore, the average value of all aspects for each group of asset and stressor criteria is calculated on each Sharia Bank, so it can be given an average value for PFA, PFL, PFE, TCR, TMR, TFR for each Sharia Bank
- 5) The step to calculate the IV BUS is by the following formula :

$$IVBUS_i = \frac{(TCR + TMR + TFR) + 1 - (PFA + PFL + PFE)}{2}$$

- 6) After that, the calculation for each aspect, indicator, and dimension at Sharia Bank level is performed
- 7) Calculates the IV BUS based on the average index value of each criterion for each Sharia Bank

The IV BUS values range from 0.00 to 1.00 with the following meanings:

Table 4. Asset and Stressor Component for Sharia Banks Volatility Measurement

Dimension	Criteria	Definition	Indicators	Data Source
Stressor	Credit Risk	Potential losses caused by the debtor's failure to recover the financing.	1. NPF is the comparison between Non Performing Finance to Total Finance 2. NPF (Net) is the NPF after reckoning the value of collateral	Bank's Quarterly Publication Report Bank's Quarterly Publication Report
	Market Risk	Potential losses arising from fluctuations in exchange rates and market interest rates.	1. NOP (Net Open Position) ratio is the comparison of the net difference between assets and passive forex to total capital.	The Report of Bank Indonesia
	Liquidity Risk	Potential losses incurred by the bank's failure to recover its short-term liabilities.	1. LDR is the ratio of total financing provided to the collected Community Fund	Bank's Quarterly Publication Report
Asset	Assets Portfolio	The bank's capability to generate income and fulfill the short-term obligations (earning asset & current asset)	1. Cash and BI's account balance. 2. BI's account balance against third party funds 3. Placement to other banks 4. Securities purchased (whether for sale or repo) 5. Financing provided 6. Investment in subsidiaries	Bank's Quarterly Publication Report
	Portfolio of liabilities	Source of funding rewards (return bearing liabilities)	1. The total of third party funds 2. Placements from other banks 3. Loans received	Bank's Quarterly Publication Report
	Equity Portfolio	The total of bank's assets after deducting all liabilities	1. The amount of paid up capital 2. Last year earnings	Bank's Quarterly Publication Report

Source: Theoretical Study

**Table 5.** Matrical Calculation of Bank Sharia Volatility Index

BUS / Sharia Commercial Bank	BUS Volatility Index							
	STRESSOR				ASSET			
	TCR	TMR	TFR	Average	PFA	PFL	PFE	Average

- The value of IV BUS closer to 0.00 means that Sharia Banks are better/have good prospects
- The value of IV BUS closer to 1,00 means that Sharia Banks are not good/have no good prospects

8) Then the average value is diverted into two dimensions namely the average value of the stressor and the asset, and then the value is compared with the average stressor or asset value of the region/city to clarify the position of each region in both dimensions. To facilitate visualizing the position of a region in the dimensions of stressor and asset, the color is given to the region with the provisions if:

- Coloration for stressor index values and IV BUS:  
Red : the average value of  $BUS_i$  stressor > the average value of BUS stressor  
Green : the average value of  $BUS_i$  stressor < the average value of BUS stressor
- Coloration for asset index values and IV BUS :  
Red : the average value of  $BUS_i$  asset < the average value of BUS stressor  
Green : the average value of  $BUS_i$  asset > the average value of BUS stressor

**4. Result, Discussion, and Managerial Implication**

Based on the results of calculations that have been made using 12 Sharia Bank and financial data of 2012, 2013, 2014, and 2015, and using Cardona method to measure the volatility of Indonesia’s sharia banking in some time.

Cardona method is one of index measurement method by using asset indicators owned by banks with the stressor (pressure) that must be faced. This method is intended to see how far the assets owned by banks can face the pressures it faces. The assets consist of: assets, liquidity, and equity, while stressors include credit risk, market risk and financial risk faced by banks.

The results of calculations performed to measure the volatility of sharia banks in Indonesia by using Cardona Method obtained the following results in table 6.

Based on the calculation, in general, it can be said that Sharia Banks in Indonesia during 2012 is categorized in: caution (yellow). The resulting yellow color indicates

that most of the sharia banks face the problems in assets whether in terms of assets, liquidity, as well as equity. The average value for each asset component shows a red mark (value smaller than 0.2), the low value indicates that the components of assets owned by sharia banks in general are in an alarming condition, only a few sharia banks with components of assets marked yellow (BRI dan Bank Muamalat in PFL component; BSM in PFA component); and some with green marks (BJB in PFL components; BSM for PFL and PFE components; and Muamalat in PFA and PFE components).

In terms of Stressor, BSM Bank has a pink color, where the stressor component of market risk is very alarming and the component of financial risk is quite considerable. While Muamalat Bank has pink marks, this means the pressures faced from the market risk and financial risk components are a quite considerable, and it can be said that stressor for Muamalat Bank is quite considerable and BSM stressor is alarming.

While for BCA Sharia and Bukopin Sharia, all components of Asset and Stressor are marked red. This indicates that the components of assets owned are unable to deal with the Stressor faced, so that the volatility index of the two sharia banks are in the category of red or danger.

In 2013, some of the stressors (pressures) faced by sharia banks are mostly marked by yellow in the market risk component, even for BSM the market and financial risk is considerable (pink) and for BSM it is an alarming (red). Bukopin Sharia this year, experiencing a quite considerable pressure in terms of market risk (yellow) and an alarming on the component of financial risk (red). Nevertheless in general, for the stressor side, most of the sharia banking average have a good condition (green color), only Bukopin, BSM, and Muamalat which have a quite considerable pressure (yellow).

Meanwhile from the Asset side, there is a change in sharia banking. BCA Sharia in 2012 experienced an alarming vulnerable index and improved in 2013 with a quite considerable vulnerable index (yellow), although in terms of asset components are still alarming but quite helpful with slowly decreasing stressors. Not so with Bukopin Shariah which still shows an alarming index volatility (pink), this is because the financial pressures are increasing and alarming in 2013.

In the same year, there were 2 additional sharia banks that have an alarming vulnerable index that is Mega Sharia and Panin Sharia. Mega sharia has decreased on the asset side, so the average assets owned by the bank is

**Table 6.** The Calculation Result of Sharia Bank Volatility Index of 2012

IVBS TH 2012									
BANK	STRESSOR			RATA2	ASSET			RATA2	IVBS
	TCR	TMR	TFR		PFA	PFL	PFE		
BCA	0.333333333	0.500163161	0.003954789	0.27915	0.009794	0.0074	0.010825965	0.00934	0.634905293
BJB	0.014991037	0.512524216	0.1288568	0.218791	0.253505	0.662929	0.041574589	0.319336	0.449727286
BNI	0.050794636	0.422992463	0.10467352	0.19282	0.169617	0.087261	0.129335026	0.128738	0.532041186
BRI	0.079833303	0.560691772	0.233616494	0.291381	0.100488	0.418007	0.167289579	0.228595	0.53139284
BUKOPIN	0.012419052	0.509454798	0.667748652	0.396541	0.042329	-0.0316	-0.007647727	0.001026	0.697757451
BSM	0.333333333	0.896954284	0.645772235	0.625353	0.599428	0.615555	0.896455149	0.703813	0.460770235
MAYBANK	0.003072136	0.297337044	0.344153265	0.214854	0.068489	0.204712	0.068733695	0.113978	0.550438055
MEGA	0.039918197	0.522049442	0.131607543	0.231192	0.069002	0.085688	0.096767961	0.067153	0.582019583
MUAMALAT	0.244311419	0.660870036	0.608354837	0.504512	0.654523	0.484276	0.889473046	0.676091	0.414210692
PANIN	0.003885447	0.500763106	0.162002105	0.222217	0.013766	0.105011	0.010261809	0.043013	0.589602029
VICTORIA	-0.007727302	0.491914951	-0.135967922	0.116073	-0.00567	-0.0316	-0.007647727	-0.01498	0.565524169
BANK SYARIAH	0.100742236	0.534155934	0.26316112	0.299353	0.17957	0.232512	0.208674669	0.206919	0.546217165

Source : Calculation Result

**Table 7.** The Calculation Result of Sharia Bank Volatility Index of 2013

IVBS 2013									
BANK	STRESSOR			RATA2	ASSET			RATA2	IVBS
	TCR	TMR	TFR		PFA	PFL	PFE		
BCA	0	0.500939876	0.123021651	0.207987	0.02925	0.004305	0.012456627	0.015337	0.596324971
BJB	0.080908158	0.511283753	0.24101293	0.277735	0.233107	0.66428	0.037229881	0.311539	0.483098014
BNI	0.157625544	0.402535892	0.240573446	0.266912	0.148596	0.227076	0.141339792	0.172337	0.547287113
BRI	0.22016191	0.562753541	0.355728548	0.379548	0.114605	0.520656	0.1691348	0.268132	0.555707955
BUKOPIN	0.17588713	0.492005203	0.819896286	0.49593	0.071231	-0.03025	-0.008642267	0.01078	0.74257476
BSM	0.666666667	0.920577517	0	0.529081	0.629639	0.45856	0.938671091	0.675623	0.426728952
MAYBANK	0.10471498	0.047824853	0.325360677	0.1593	0.076809	0.094681	0.060297751	0.077262	0.541018849
MEGA	0.142052205	0.521977822	0.239257807	0.301096	0.06177	0.048964	0.087580483	0.066105	0.617495497
MUAMALAT	0.209334686	0.682166478	0.638216959	0.509906	0.658954	0.45757	0.86336406	0.659963	0.424971571
PANIN	0.04323677	0.50702758	0.313156448	0.287807	0.027724	0.02655	0.0269177	0.027064	0.630371551
VICTORIA	-0.006093434	0.492005203	0	0.161971	-0.00342	-0.03025	-0.008642267	-0.0141	0.588036562
BANK SYARIAH	0.163135874	0.512827065	0.299656796	0.325207	0.186206	0.222013	0.210882514	0.206367	0.559419618

Source : Calculation Result

categorized as dangerous. The same thing also happens to Panin sharia, Owned assets are categorized as dangerous, making it less able to deal with the pressures faced mainly from market risk pressures.

Generally, in 2013 sharia banking is still in the condition of a quite considerable volatility index (yellow).

In 2014, from 12 sharia banks there are banks with the quite considerable index of volatility characterized by yellow, which is: BCA, BJB, BNI, BRI, BSM, Maybank, Muamalat. Whereas the rest of an alarming volatility index is characterized by pink color, which is: Bukopin, Mega, Panin, Victoria, and BTPN.

Problems faced by sharia banking with an alarming volatility index is due to the volatility in term of asset so banks are unable to deal with vulnerabilities in term of pressure (stressor) encountered.

BTPN as the new sharia bank in sharia banking industry, face the pressures in term of alarming credit risks and a quite considerable market risk pressures. As a new player, BTPN still needs adjustments to the condition of the sharia banking market that faced with assets owned and categorized as dangerous.

In general, the volatility index of sharia banking in 2014 is still quite considerable which is marked with yellow.

In 2015, there is a significant change, the volatility index of some sharia banks has improved. Some sharia banks that have a small volatility index are marked with green color, including BJB, BSM, Muamalat, and the newcomers BTPN. The improving volatility index of some sharia banks is certainly encouraging, this can be interpreted that some pressure (stressor) encountered, can be reduced (BSM and Muamalat) even be eliminated (BJB). And surprisingly BTPN as a newcomer can quickly make adjustments to pressure and improve on the asset side, so that within two years period it can have a small volatility index.

Nevertheless, some of sharia banks still have a quite considerable volatility index but have improved from the stressor side. Some banks can reduce and even eliminate the pressures encountered whether from credit risk, market risk and financial risk from time to time continue to be improved. Improvement efforts in term of stressor are quite encouraging but still facing the volatility in term of asset, so this will affect the volatility index that encountered is still quite considerable marked by yellow.

While if it seen from sharia banking as a whole, the volatility index encountered is quite considerable, this is due to sharia banking in general has not been able to cope the volatility in term of assets well.

**Relationship between Asset – Stressor with Sharia Bank Financial Performance**

**Table 8.** The Calculation Result of Sharia Bank Volatility Index of 2014

IVBS 2014									
BANK	STRESSOR			RATA2	ASET			RATA2	IVBS
	TCR	TMR	TFR		PFA	PFL	PFE		
BCA	0.002360928	0.507989911	0.123021651	0.211124	0.030803	0.004349	0.012456627	0.01587	0.597627282
BJB	0.055384422	0.518040988	0.24101293	0.271479	0.234995	0.66428	0.037229881	0.312168	0.479655625
BNI	0.130866931	0.408263559	0.240573446	0.259901	0.14928	0.227076	0.141339792	0.172565	0.543668111
BRI	0.161379134	0.568053844	0.355728548	0.361721	0.116317	0.520656	0.1691348	0.268703	0.54650894
BUKOPIN	0.11383955	0.499308147	0.819896286	0.477681	0.071218	-0.01593	-0.008642267	0.01555	0.731065887
BSM	0.601357884	0.920577517	0	0.507312	0.62884	0.458597	0.938671091	0.675369	0.415971214
MAYBANK	0.06673302	0.054901492	0.325360677	0.148998	0.078972	0.101164	0.060297751	0.080145	0.534426899
MEGA	0.099443747	0.528225444	0.239257807	0.288976	0.063854	0.057357	0.087580483	0.069597	0.609689272
MUAMALAT	0.190583009	0.683642639	0.638216959	0.504148	0.658874	0.461322	0.86336406	0.661187	0.421480418
PANIN	0.030569278	0.513905293	0.313156448	0.285877	0.03005	0.036094	0.0269177	0.03102	0.627428354
VICTORIA	0.16425374	0.5	0.03777329	0.234009	0.010813	0.007991	0.005383027	0.008063	0.612973246
BTPN	0.772525327	0.501614321	0.073174954	0.449105	0.088666	0.0083	0.024900714	0.040622	0.704241274
BANK SYARIAH	0.199108081	0.517043596	0.283931083	0.333361	0.180223	0.210938	0.196552805	0.195905	0.568728044

Source : Calculation Result

**Table 9.** The Calculation Result of Sharia Bank Volatility Index of 2015

IVBS 2015									
BANK	STRESSOR			RATA2	ASET			RATA2	IVBS
	TCR	TMR	TFR		PFA	PFL	PFE		
BCA	0	0.11430972	0.2484077	0.12090581	0.04345218	0.00780019	0.242263166	0.0978385	0.511533655
BJB	0.11410256	0.0613716	0.12259957	0.09935791	0.20058873	0.51764284	0.803337157	0.507189576	0.296084167
BNI	0.03351648	0.18336302	0.25500026	0.15729326	0.12668397	0.03271156	0.431804896	0.19706681	0.480113223
BRI	0.07619048	0.24863014	0.32544441	0.21675501	0.16219043	0.48841977	0.449848423	0.36681954	0.424967735
BUKOPIN	0.04194139	0.08069476	0.12336657	0.08200091	0.04370214	0.06020361	0.162106352	0.088670702	0.496665103
BSM	0.0981685	0.25	0.54637558	0.29818136	0.59908952	0.21619644	0.908374432	0.574553465	0.361813947
MAYBANK	-0.0128205	-0.0218696	-0.05174018	-0.0288101	-0.0036528	-0.0091049	0.030483718	0.005908676	0.482640612
MEGA	0.06520147	0.08335247	0.05571281	0.06808892	0.02384318	0.03767748	0.189899777	0.083806814	0.49214105
MUJAMALAT	0.06373626	0.12895348	0.40385242	0.19884739	0.48394375	0.63562896	0.462446669	0.527339792	0.335753798
PANIN	0.03534799	0.11307573	0.12899781	0.09247384	0.02987896	0.04495831	0.250363036	0.108400102	0.49203687
VICTORIA	0.01007326	0	0	0.00335775	0.00366377	0.0013164	0.061732915	0.022237695	0.490560029
BTPN	0.16666667	0	0.15377072	0.10681246	0.60732466	0.00976963	0.780557612	0.465883967	0.320464248
BANK SYARIAH	0.05767705	0.10349011	0.19264897	0.11793871	0.19339238	0.17026835	0.397768179	0.253809637	0.432064536

Source : Calculation Result

In this research the related asset components and stressor components form a matrix that describes the relationship between an asset and a stressor which can be described as follows.

From table 10 shown below, it appears that Stressor (Credit Risk, Market Risk and Liquidity Risk) which is negative will exacerbate the Asset side (Total Asset, Total Liabilities and Total Equity). Further explanation of the impact of Stressors on Assets can be seen in Table 10 shown.

## 5. Conclusions and Recommendations

### 5.1. Conclusions

From the study conducted on the index of volatility of sharia banking during the period of 2012 to 2015, by using the stressor indicator consisting of components: credit risk pressures, market risk pressures, and financial risk pressures; while in terms of assets with components: asset performance, financial performance, and equity performance that show the following result:

1. For some time, sharia banking is experiencing a quite considerable pressure whether from the credit, financial, and market sides. Similarly in terms of assets, which have not been able to cope the pressure occurred, so it has an impact on the volatility index in 2012 to 2014 is still quite alarming marked in yellow.
2. Significant improvements occur in 2015, some of the sharia banks have a good volatility index that is marked in green. The improved index is due to the

improvements in term of stressor (some sharia banks are able to reduce and even eliminate the pressure encountered, although in terms of asset volatility it still can not indicate a significant improvement).

3. Sharia banks that have a good volatility index marked with green, in general are a large sharia banks especially in terms of assets, with equity, and financial components.
4. While sharia banks with a quite considerable volatility index marked with yellow, in general are banks with the side of an alarming asset issue.

### 5.2 Recommendations

Based on the calculation above, several things can be recommended for sharia banking as follows:

1. Management of sharia banks not apart from the bank's ability to cultivating the assets and confront or reduce the pressure faced, so that sharia banking is expected to be able to manage its bank operations well so that it can avoid the risks encountered and perform the asset management as well as possible.
2. In facing the competition, sharia banks are not only competing with fellow sharia banks but also claimed to be able to compete with conventional banks, so needs for good sharia banking governance and in accordance with the rules applicable in Indonesia

Table 10. The Relation Between Asset-Stressor and Financial Performance

				ASSET			
				Total Asset	Total Liabilities	Total Ekuitas	
STRESSOR	RATIO	COMPONENT	DESCRIP				
	CREDIT RISK	NPF gross	Total F	NPF GROSS buruk bilamana angkanya meningkat dan memengaruhi laba karena kehilangan potensi pendp bunga dan peningkatan biaya kredit macet	Kenaikan NPF akan mengurangi total asset karena ada penyisihan penghapusan aktiva produktif yang lebih besar	Kenaikan NPF dalam jangka panjang dapat mengganggu likuiditas bank dan mengurangi kredibilitas bank	Kenaikan NPF akan mengurangi ekuitas karena ada penyisihan penghapusan aktiva produktif yang lebih besar
		MARKET RISK	Aktiva Valas	NET OPEN yang negatip bersifat buruk bagi bank karena berpotensi kerugian bilamana ada depresiasi kurs	Jika Net Open Position negatip yaitu bank memiliki kewajiban valas lebih besar dari aset valas, maka bank akan mengalami kenaikan aset ketika terjadi depresiasi kurs	Jika Net Open Position negatip yaitu bank memiliki kewajiban valas lebih besar dari aset valas, maka bank akan mengalami kenaikan jumlah kewajiban bank bila terjadi depresiasi kurs	Jika Net Open Position negatip yaitu bank memiliki kewajiban valas lebih besar dari aset valas, maka bank rentan kerugian valas bila kurs rupiah merosot. Kerugian akan menurunkan modal
			Passiva Valas				
			Total Modal				
		LIQUIDITY RISK	Pembiayaan	LDR buruk jika diatas 100% karena berpotensi menimbulkan kesulitan likuiditas dan menyebabkan bank harus menyediakan alat likuid dari pasar uang yang lebih mahal.	Untuk mengatasi liquidity risk bank harus melakukan konversi pos asset liquid kepada cash / BI , misalnya dari SBI dijual menjadi Kas dan Kas dipergunakan untuk memenuhi kewajiban jangka pendek.	Posisi likuiditas menurun akan menyebabkan risiko kegagalan bank memenuhi kewajiban jangka pendek meningkat dan meningkat pula ketidakpercayaan publik dan akan menyebabkan bank bersangkutan kesulitan pendanaan.	Liquidity risk berpotensi mengurangi ekuitas bilamana bank harus memenuhi kewajiban jangka pendeknya dengan membeli dana dari pasar uang.
	Dana Pihak III						

Source : Calculation Result

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