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The Foreign Asset Leverage Effect of Oil & Gas Companies after the Financial Crisis

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Abstract

This study aims to analyze the foreign asset leverage effect on Korean oil & gas companies' foreign profits and to maintain the appropriate foreign asset volume for reducing exchange risk. For a long time, large Korean companies, including oil companies, overheld foreign currency liabilities. For this reason, most large companies have been burdened to hedge exchange risk and this excess limit holding deteriorated total profit and reduced foreign currency asset management efficiency.

Our paper proceeds in presenting a three-stage analysis considering diversified exchange risk factors through estimation on transformation of foreign transactions a/c including annual trends of foreign asset and industry specifics. We also supplement incomplete the estimation method through a practical hedging case investigation. Our research parts are differentiated on the analyzing four periods considering period-specifics

The FER value of the oil firms ranged from -0.3 to +2.3 over the entire period. The results of the FER Value are volatile and irregular; those results do not represent the industry standard comparative index. The Korean oil firms are over the credit limit without accurate prediction and finance high interest rate funds from foreign-owned banks on the basis on a biased relationship. Since the IMF crisis, liabilities of global firms have decreased. Above all, oil firms need to finance a minimum limit without opportunity losses on the demand forecast and prepare for uncertainty in the market. To reduce exchange risk from the over-the-limit position, we must consider factors that affect the corporate exchange risk on the entire business process, including the contract phase.

Keywords: Exchange Risk, Foreign Asset, Foreign Asset Leverage Effect, Foreign Currency Translation Profit.
JEL Classifications: D12, F14, O53

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Ⅰ. Introduction

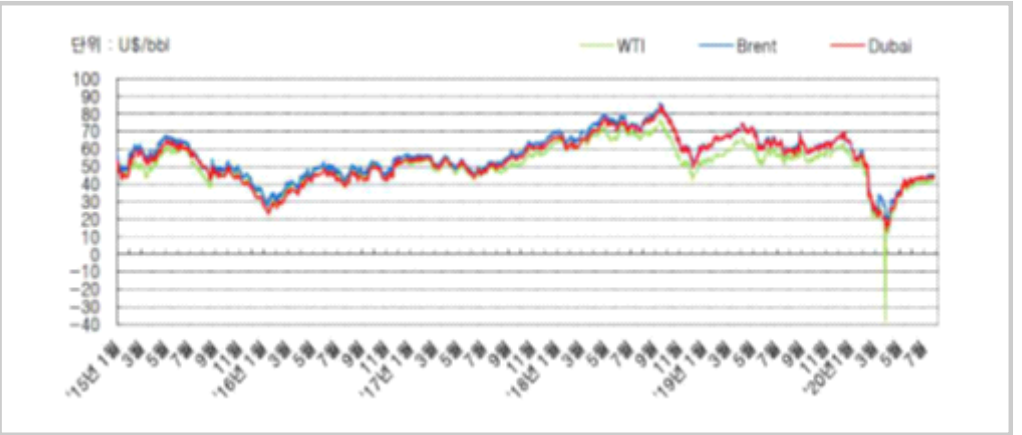
In relation with foreign asset management style, precedent research is introduced. First, Korean oil refiners have been observed overusing hedge products to reduce exchange risk, rather than using strategic intrinsic transactions. Kim Sun-Sung (2019) asserts that risk management strategy and the practices of state-run oil & gas companies of Mexico, Pemex and the four representative Korean oil & gas companies are based on each annual report by Pemex and by the four Korean firms focusing on foreign exchange rate exposure and the risk management on it. Korean firms are likely to use financial hedging instruments such as financial derivatives for FX hedge than become involved in exporting and importing activities in a revenue-creating process, which means that Korean firms are more sensitive to transaction exposure. On the other hand, Pemex is expected to be more sensitive to long-term economic exposure.

The second theme is that research is presented claiming that foreign gain and loss A/C are more important than before the implementation of a new accounting system, K-IFRS, on impacting total profitability and corporate value. Jeaong Sung-Il and Lee Gi-Se (2019), found that the gain or loss on transactions of foreign currency and the gain or loss on the translation of foreign currency has an effect on the value of companies, and how different they are. After Korea accepted K-IFRS, some policies were implemented, such as functional currency and the accounting rule about economic currency, to help the firms having trouble on the of variability of foreign currency. A gain or loss on transaction of foreign currency has relatively much value relevance than the gain or loss of translation of foreign currency. The results show that the industry group, which has high assets and debt denominated in foreign currency and export a high volume of products, can be affected with regards to variability currency.

The third research stresses that foreign currency gain or loss is implied in future corporate value rather than in the short-term and is the reason why profitability on foreign assets is managed for the corporate value. Lee Gun-Jae(2019), testified that empirical tests using the KOSPI listed firms' financial data show that the foreign currency transaction gains and losses (FCGLs) forecast the next-period operating income. The value-relevance tests reveal that FCGLs are irrelevant to current stock prices implying that the information embedded in FCGLs regarding future operating income is not incorporated into current prices in a timely manner.

The fourth precedent research stresses that accounting exposure risk volume on a foreign currency denominated asset is appraised as a weak-profitable company by an external group. This study results implies that foreign transaction corporations keep balances on suitable foreign assets. Kim Young-Wook (2017), This study investigates the effect of accounting foreign exchange risk exposure on earnings response coefficients and the effect of accounting foreign exchange risk management effectiveness on ERC. This study also examines the impact of FXRM using currency derivatives on ERC. This study is designed to review the appropriateness of the efforts that the firms have made for foreign exchange risk management and verify the necessity of active and systematic foreign exchange risk management, in particular using currency derivatives. Finally, the incremental and positive effect of FXRM using currency

Fig. 1. The Foreign-invested Company Ratio by Industry



Source: Korea National Oil Corporation, Weekly Reports (2020.08.21).

derivatives on ERC is larger for a high FXR group than for a low FXR group.In summary, the aforementioned results suggest that investors may negatively evaluate the earnings of high FXR firms and positively evaluate the earnings of high FXRM firms, which may be less likely for high FXR firms than for low FXR firms.

As precedent research follows, most firms' foreign asset volume and profit impact firms' profitability and strategic value on stock price.

How does foreign asset volume affect the foreign exchange earnings and the trend of change in foreign asset & net profit before and after the financial crisis? The emergence of financial derivatives such as "KIKO" and the increase in foreign transactions turn to the increase of direct and indirect exposed assets since the late 1990s. It is analyzed that the company's foreign exchange profits have been identified with respect to other financial A/C regarding the foreign asset composition and the impact of the volume on profit.

This study is especially highlighted in relation with holding foreign assets & liabilities of the analyzed firms. How much volume of foreign currency assets can support profitability without loss? That critical level is evaluated with the foreign asset leverage effect on the foreign currency profit. Is a limit needed on market fluctuation? Can global business firms use any tools and methods that reduce exposure risk from a strategic perspective as much as possible? Also, we derive competitive foreign asset management for different situations based on the results. How can existing foreign borrowing types be improved and take om improved borrowing strategies to hedge exchange risk better than before?

It is important to analyze the impacts of the hedging exchange rate risk on crude oil price and the strategies of major oil firms in the Middle East, and to communicate relevant information to business executives. In addition, the recent effect of COVID-19 on the crude oil and petroleum products market was analyzed through official oil price tables. The major oil refineries and growth strategies were identified. Usually, the price of the oil and gas is affected by production level and

stock volume. Some cases are influenced by global economic fluctuation. Since the worldwide COVID-19 pandemic, the oil price index has fallen sharply in the world oil market. The index of crude oil price has fallen about 30% compared to the end of 2019. That downstream was a result of the decrease in demand due to temporal economic recession. However, Korean oil refinery firms still keep continuing to develop exchange rate risk hedging tools and derivatives to prepare for the oil price-up and exchange rate volatility. Recently, the Korean FX market conditions have been relatively stable compared to other time periods of the worldwide temporal economic crisis. Additionally, the Korean monetary market situations are stable; the KRW short-term (90 days) borrowing rate is below 1%. Korean oil firms need to keep the minimum foreign credit limit without idle costs. As possible, the short-term KRW credit line of most oil firms is used to settle oil imports instead of used for repayment of foreign currency borrowing. Global major oil firms such as BP, Chevron and Shell try to transform charging for the reduction of oil demand. Global oil companies also vigorously practice reorganization, joint venture and corporate division preparing for investors' support and interest.

Ⅱ. Literature Review

1. Historical Review Points

We surveyed previous relevant domestic and overseas research papers based on exchange rate risk and foreign revenue of the oil and gas industry.

The previously surveyed studies are used as guidelines to find contributions and help us set our research process on the point of consideration in diverse impacting factors. Historical research papers focused on reducing the external risks and drawing out finding exchange rate risk hedging methods. The research types of the many precedent papers are insufficient to draw practical solutions which are suited to asset composition structure and reciprocal comparison analysis between foreign asset composition and corporate profitability. Our research specifically draws on the competitive exposure risk hedging methods and solutions which are reflected transition characters since the IMF crisis. Through analyzing the trend formation of the foreign assets and liabilities, our paper looks to find interrelations between foreign asset composition structure and the foreign operation effect toward high profitability.

There is no research paper using similar statical analysis to measure the correlation between volatility and profitability of foreign currency denominated assets and liabilities after the Asian financial crisis. The difficulty of applying an appropriate analysis methods using sophisticated statistical techniques is complemented by the actual hedging case related to the foreign assets and liabilities of the oil refineries.

A recent study on risk hedging cases of foreign currency- denominated assets using simple average comparison techniques for historical variable trends was prepared by Song Woon-kyung , Woo-Bin An and Sang-Beom Han (2020). That research deals with various financial techniques to reduce market risk from fluctuation in foreign currency assets held by domestic and foreign airlines. To manage exchange rate risk, these airlines use natural hedge as well as various currency derivatives including forward, swap, and option. To reduce fuel price risk, the

airlines use swap, option, collar on brent oil, jet fuel, gas oil, and crude oil. To hedge interest rate risk, the airlines use interest rate swap and manage target fixed-rate to floating-rate debt ratio.

Another research paper which entails correlation between exposure risk factor and foreign currency profits using trend analysis method is written by Gwan Take- Ho and Jae- Man, Jeong(2021). This study shows that many Korean companies are experiencing corporate value fluctuations in response to exchange rate fluctuations due to inadequate foreign exchange gain/loss management. It also suggests that more attention is required to accounting foreign exchange risk management.

Ito Takatoshi, et al. (2013),presented research that mentioned that they estimate exchange rate exposure and investigate the impact of exchange rate risk management on Japanese firms. That findings are that firms with a high dependency on foreign markets have high risk of exchange exposure. The higher the U.S. dollar invoicing share, the larger the exchange rate exposure, but that is reduced by the using effective hedge instruments. Yen invoicing itself reduces the foreign exchange exposure. This study implies that global firms should take and practice diverse hedge methods (payment currency) at the contract phase against counter parties. The hedging method from the beginning phase upgrade and smooth foreign asset (liability) management process leads toward high profitability. Sarada (2018)'s paper maintains that the operation performance of India's steel manufacturing firms was affected by the firm capital structure. Most Indian manufacturing firms are bound to depend on external capital, resulting in the decision to be taken on the leverage ratio as even more crucial. Important several determinants have been found: profitability, asset structure, size, growth opportunities, non-debt tax shield, liquidity, and risk.

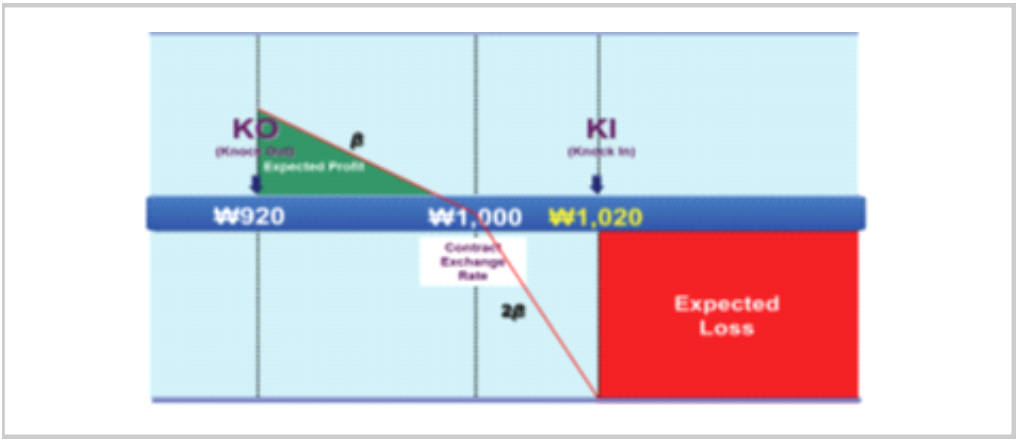
Augustine (2017)'s research asserted that the performance of global firms was influenced by exchange rate volatility. The objective of the research was to investigate how exchange rate fluctuation affects operation performance of multinational corporations in Nigeria. That study concluded that exchange rate instability affects the operations of companies in Nigeria vis-a-vis international trade with other countries of the world. Multinational companies should develop a robust foreign exchange risk management framework which will clearly show its currency risk assessment procedures and implementation of foreign exchange risk management strategy. Kwon Taek-Ho (2017)'s research mentions that large firms executing global business transactions should prepare for an exchange rate risk hedge strategy to reduce exposure risk. Previous studies and the test results of this research support the notion that forecasting an optimal hedge ratio has less to do with a firm's intention but more to do with the firm's ability, which is not easy to improve over a short period. Oh Suk-Yang (2019)'s study asserted to estimate exchange rate volatility which regards firms' stable index. This paper's contribution comprises broadening the analytical measurement and determining factors of foreign exchange exposure and adding the concept of foreign exchange volatility exposure to help our understanding of new aspects of foreign exchange exposure. Park Kyeong-In and Ga-Yeon Lee (2017)'s paper mentions estimating exposure risk between foreign-currency borrowing firms and non-foreign currency firms. Foreign-currency borrowings

show a higher debt-to-equity ratio, borrowing ratio and exporting ratio than companies without foreign-currency borrowings.

2. KIKO and Derivatives' Effect Review

The price of oil and natural gas sharply fluctuates on market conditions and global economic circumstances. Many countries excluding several OPEC countries, the U.S.A, Russia and some South American oil-producing countries import crude oil. Due to this, a high foreign currency credit limit was needed to pay oil imports. The most used payment currency is U.S dollars and the Euro. The primary reason of the burden from oil importing is because of the price fluctuation and exchange rate rising against the U.S dollar. Korean oil refinery firms should hedge exchange rate risk using diverse derivatives as much as possible in order to reduce exposure risk. For a long time, the Korea FX market was unstable; KRW was also weakened at the global economic crisis in addition to some business recession. Korean oil refinery firms have used ineffective derivatives which were a one-sided recommended by trading banks that did not have cost burden problems or any outlook. As a result, many derivatives are a part of the hidden counter party's intentional benefits. The maturity of the derivatives relating oil imports settlement is on a short-term base and purely should be used to hedge exposure risk on the current transaction. In the mid-2000s, Many Korean firms used derivatives to obtain profit on the investment basis excluding current transaction bases. Considering the trends of the increasing demand to use derivatives for the purpose of speculation, financial institutions including foreign investment corps, put high-risk derivatives on the market. At that time, many Korean firms invested using several high-risk derivatives. Regarding financial derivatives in hedging exposure risk, financial markets derivatives are not perfect and there is some friction, such as financial distress costs, agency problems, or information asymmetry. Many research papers have suggested that global business companies should use effective derivatives for those reasons. For example, adopting hedging tools could decrease exposed risks of the firm by the reducing the volatility of future cash flows, thereby reducing the probability of bankruptcy . Thus, we find that when examining the effect of hedging with derivatives on oil and gas firm value, it is necessary to take the local context into account, given the inconsistent empirical findings and the need to understand diverse contexts. Through our research process, we try to analyze the momentum for using derivatives and the effectiveness of derivatives using on the oil and gas firm value and risks in Korean global firms. Several years ago, the derivatives market in Korea was been one of the biggest derivatives markets in the world, but it has sharply decreased since 2011. One of the main reasons for this downfall is the KIKO (knock-in and knock-out) incident in 2008. KIKO hedge products are currency derivatives that enable firms to sell dollars at a fixed rate if the exchange rate stays within the range set. If the exchange rate moves out of the set range, firms may sustain huge losses with buying dollars on the foreign exchange market as an expensive rate and sell them to the banks at that low rate. Fig. 1 shows the structure of KIKO and how firms using KIKO suffer lossesThis KiKO derivatives illustrates how to cope with

Fig. 2. Knock-In Knock-Out (KIKO)



Source: Financial Derivatives product

foreign exchange risks and provides basic knowledge on currency option derivatives to prevent future problems.

Our study strengthens in testifying research setting tasks and supplements insufficient parts to reach the research goal by the existing research review. Especially, the above domestic and foreign originated papers are helpful in guiding our research direction and taking an accurate analysis approach on oil manufacturing business environment comprehension

Ⅲ. Empirical Framework and Hypothesis

1. Research Model

Our case study analyzed which foreign currency asset & liability size of the Korean oil & gas firms impact foreign profit on the basis of the financial statement for 20 years (2000~2018). Our research follows (FER value) trends on the firm and in some comparative industries. This estimation considers economic factors and corporation specific factors. Three oil refineries' sales account for more than 95% of the total oil industry's sales over the decades. We can find how much foreign currency denominated assets of total oil industry's holding impacted to get revenue and business performance through investigation of the three oil refineries' foreign currency account fluctuation related to global business activity. Especially, three analyzed oil refineries sales come from exports above 50% and crude oil imports of the three oil refineries account for 99% of all imports. All transaction of three oil refineries are almost denominated in foreign currency, which is linked to the company's profitability depending on how it manages its foreign assets and liabilities. Through this empirical study, we can provide guidance on how to manage foreign denominated currency assets of oil refinery industry. Deficiencies such as insufficient statistics related to the leverage analysis of foreign assets and liabilities shall be supplemented by individual transactions and case study.

1) Equation (1) is a measure of the dependency between foreign transaction a/c including foreign assets (liabilities), and net foreign profit. Additionally, economic and industry specific valuables fluctuates for the entire period (1997~2018). The research focus on the trend valuation is specially to analyze the extent of influence between foreign asset & liability volume & two factor composition ratio and net foreign profit.

$$* y = \frac{\sum_{t=1}^{21} x_t}{N},\ x_i = x_1, x_2, x_3 \cdots\cdots\cdots x_t$$

→1998~2018 (1)

x_i = $i$year, Independent valuables→ Net foreign profit, exchange rate, oil price index, CD91 days rate,

x_i^{fa} = value trends of the foreign asset volume

x_i^{li} = value trends of the net foreign liability

x_i^{fp} = value trends of the net foreign profit

x_i^{er} = value trends of the exchange rate level

x_i^{ir} = value trends of the KRW interest rate

y_t = dependent valuables, sum average of each independent the valuable,

2) Equation (2), (3) FER value is estimated on the basis of foreign transaction financial statement A/C on oil & gas firms and other comparative industries for the 21 years → 1998~2018

$$*\mathbf{FER}=NFP/NFA \times 100 \quad (2)$$

$$* y_i^{fer} = \frac{\sum_{t=1}^{21} x_t}{N},\ x_i = x_1, x_2, x_3 \cdots\cdots x_t \quad (3)$$

FER: foreign asset leverage effect ratio,

NFP: net foreign profit (gain-loss)

NFA: net foreign asset (asset - liability)

x_i : Independent valuables, trend of each valuable (Net foreign profit and Net foreign asset)

yi : Dependent valuables, sum average of each FER value, Foreign asset leverage Effect Ratio, 1998~2018

Its value implies an efficient level of foreign asset position for hedging the exchange risk and additional revenue; the FER value is volatile and irregularly depends on managing exposure foreign asset and reducing exchange risk. However, the FER value is volatile depending on the market situation. A company with a high FER value is evaluated, which keeps the foreign asset size stable plus the stakeholder relationship.

The company with the high FER value can relatively manage exposure risk and borrow low cost fund matching in timing. The profitability of some companies with negative FER valuation has been affected by the translation risk on excess credit limits.

We can find that Korea's global companies have been in trouble to maintain foreign assets without opportunity loss for a long time. Our research on FER valuation is beneficial to manage proper foreign currency denominated assets of global business companies including oil refineries. In particular, each company's FER value should be verified at least and reported on a monthly basis that the level of FER value is appropriate. Past failure experiences and case studies have shown that global business firms with high FER value have increased operating results and improved profitability. The use of the FER values associated with counter party's credit level is beneficial for

Table 1. Global Business Group Category on Firm's FER Value Range

Level	Grade	Asset, ProfitGrowth (+)Down(-)	Operation Specific	Range & Industry Type
1. High FER (steady)	good level	Both (+)	market growth exposure risk hedge, down	above 10 (part domestic business)
2. High FER (temporal)	good	Profit (+)	non-actual profit increase	4~ 9 (over export)
3. Low FER (ordinary)	moderate	Profit (-)	transaction and non-actual loss increase	1~ 3 (Ex = Im)
4. Low FER (steady)	bad	Both (-)	market down more exposure risk influenced	minus over import

Note: .FER value was surveyed on selected industry representative firms for 20 years→ 1998~2018.

analyzing how foreign denominated asset leverage of some potential partners come into effect.

Table 1 shows that the FER value of the global business firm was estimated at the level of exchange risk management & market growth rate. The survey found that FER values range from (-)1.0 to (+)7.9, and that companies with a high FER value manage foreign currency asset leverage levels and market potential as important factors of influence. According to the final estimation, the decision process at the category level is insufficient because of objective unreliable evidence. If FER value is calculated to be more than 10, this group is recognized as a high FER level group. In fact,, this group belongs to domestic business firms and accounts for a small portion of the total market size.

3) Through further analysis regarding companies showing a high effect at stage I, we draw out the relation factors; there are funding types & other financial A/C which impact foreign leverage effect.

- Foreign transaction gain and loss volume trend:1998~2018
- Foreign translation gain and loss volume trend: 1998~2018
- Composition of total foreign profit: 1998~2018: 1998~2018
- Manage and comprehend level the exchange rate exposure risk

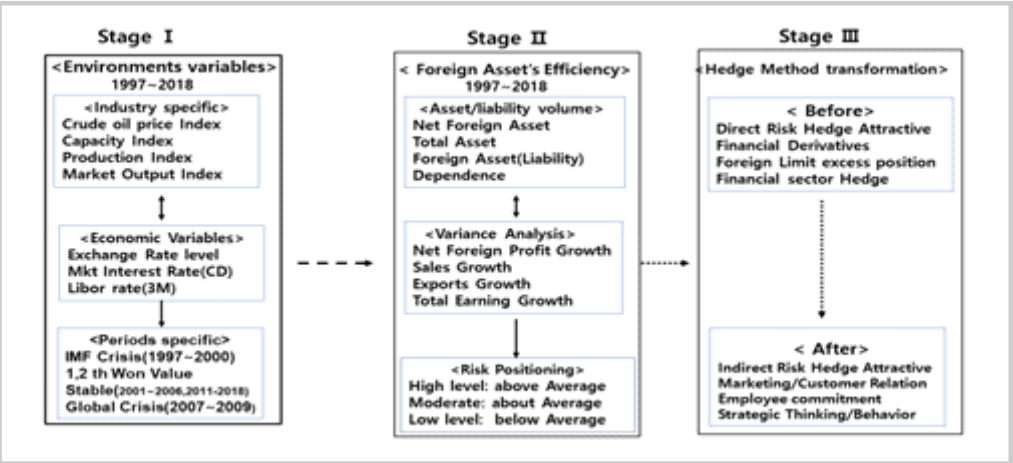
Fig. 3 This study shows an explanation of the subject structure, and to takes into account supplementary factors affecting the research objectives. Consider the foreign currency financial statement, some market environment factors and the funding style of the analyzed firms (internal organization culture, etc.).

Ⅳ. Empirical Analysis Results

1. Empirical Method

This method of analysis uses a weighted average simple comparison method based on

Fig. 3. Drivers of Sequenced Analysis between Foreign Asset and Profits



foreign transactions related to financial A/C. Detail analysis is used to calculate the total asset size and net foreign currency asset size (foreign asset minus foreign liability). High net foreign asset ratio companies are more exposed to exchange risk than lower ones. The growth rate of net foreign assets is calculated on an annual base for the whole period in relation to the size of sales & exports. High net foreign asset growth in proportion to sales-increasing firms are appraised foreign asset management. Net income foreign currency transactions are calculated as the amount less foreign currency loss from foreign currency gains, with the increase being as follows: result value of a valuable analysis, including the value of foreign currency denominated transactions and foreign currency translation gains, is affected by the volatility of the exchange rate and fluctuation. Considering the factors such as the Korean oil and gas companies' overseas business operations of more than 90 percent, the volatility of the exchange rate (Won- dollar) is an important factor. Most of all, the size of foreign currency transaction profits has a greater impact on foreign asset management strategies such as appropriate limit and diversified hedging instruments than market factors. Given some market factors, the index of imported oil price is calculated over the entire period. Its price fluctuations affect a drop in total sales and a fall in foreign debt limits. Finally, more asset management strategies and market relationships are needed during the period of high oil prices than before.

Another macro factor is the difference between the Libor rate and Korean won rate, and foreign currency funding is attracted to the higher interest gap, which is generally 2 percent lower, on average, than the Korean rate throughout the analysis period.

2. Analysis Data

1) Target Survey Industry

The refining industry was exposed to higher exchange rate risk exposure than other industries. In this study, three oil

Table 2. Economic Factors & Sales Volume Trends: 1998~2018

(Unit: Dollars)

Composing	Total	IMF Crisis	1nd Won Stable	Global Crisis	2nd Won Stable
Exchange Rate (Average)	1,140	1,238	1,143	1,116	1,113
Exchange Rate (booking)	1,129	1,202	1,111	1,124	1,118
Oil-Price Index	59.3	9.6	37.8	77.0	81.4
Market Interest Rate (KRW)	4.3	9.7	4.4	4.0	4.0
3M Libor Rate (USD)	2.3	5.8	2.8	1.7	0.9
Sales Volume Growth	108.9	73.7	112.0	122.0	99.7
Net foreign Asset Growth	104.6	76.1	98.6	120.3	99.0
Net foreign Asset Growth	116.8	85.1	121.5	129.0	104.5
Net foreign Profit Growth	194.4	-38.0	724.1	461.0	-273.5

Note: IMF crisis 1998~2000, 1st Won stable 2001~2006, Global crisis 2007~2010, 2nd Won stable 2011~2018 source: Korea the Financial Supervisory Service Dart system.

companies were surveyed as representative companies of the oil refining industry

2) Analysis Data sourcing

From 1998 to 2018, the items of foreign currency assets and profitability financial statements related to overseas business were obtained from the Dart system of the Financial Supervisory Service of Korea.

B/S: Total asset/liability, Foreign Asset/ liability volume/ratio

P/L: Sales, Export volume/ratio Net foreign profit, Operation Net Income, Translation profit volume Economic Factors: Exchange rate, Interest rate, Oil price Index

3) Analysis Period Specific

*IMF crisis period: first KRW value weak (1998~2000)

*1st Stable period: first KRW value stability (2001~2006)

*Sub- Prime crisis: second KRW value weak (2007~2010)

*2nd Stable period: second KRW value stability (2011~2018)

Table 2 shows that economic factors including exchange rate, interest rate and oil price fluctuate over the entire period, and how the size of a company's sales and exports increases proportionally depending on the growth rate of the foreign assets and profits. Since the IMF crisis, foreign liabilities

Table 3. FER Value Trends on Oil & Gas Company

(Unit: %)

Composing	Total	IMF Crisis	1st Won Stability	Global Crisis	2nd Won Staility
A. Company	-0.3	-9.7	16.6	-16.3	-1.3
B. Company	2.4	13.4	3.1	2.0	0.0
C. Company	0.8	13.1	6.6	-16.3	0.2
Oil Total	2.3	13.1	8.8	-10.2	-0.4
FRE Growth	-7.0	-42.7	552.5	-278.5	-276.5

Note: IMF crisis 1998~2000,1st Won stability 2001~2006, Global crisis 2007~2010, 2nd Won stability 2011~2018

source: Korea the Financial Supervisory Service Dart system.

of the global company have been decreased depending on the amount of debt to be paid. For that 20 years, net foreign asset growth rate was 104 percent, compared to a 108.9 percent increase in sales. Net foreign profit growth is 198 percent; much higher than the sales growth rate. This is due to market variables, ₩/$ exchange rate volatility, etc. For a long time, the reason that oil companies mainly financed foreign currency borrowing has long been the reason why foreign borrowing rates are 2.3 percent lower than the 4.3 percent Korean borrowing rate. For this reason, most net foreign asset positions of Korean companies have been negative for a long time.

Ⅴ. Empirical Analysis Results

Foreign asset & liability limits are needed for payment and receipts for overseas business, and in some cases, foreign assets & liabilities that are overbooked are exposed to exchange rate risks. This overbooked foreign borrowing style is the reason why decreased foreign currency profits occur in case of won value appreciation. At the end of the year, foreign currency denominated assets are translated to local currency.

The foreign translation profits of global business companies are affected by the exchange rate fluctuation. Therefore, global firms should prepare potential hedging strategies to reduce exposure risk. The FER values of some companies indicate their foreign asset management capacities and levels. For a long time, the FER value of most Korean conglomerates have been negative and irregular. However, the change in value of FER after the IMF crisis and the global crisis is positive and increased compared to the two crisis periods. Other research sectors are composed of the trends estimation of the derivatives profit and foreign exchange valuation profit for oil companies and industries. The ratio of foreign exchange valuation gains to loss affects the total profits of the firm. Although those valuation gains are not actually realized, this amount affects the credit rating and the burden of interest costs. In the future, many diverse and complex derivatives will be used to hedge exposure risks relating to global business projects. In the face of market instability, the contracted derivative balances are booked in

Table 4. FER Value Trends Comparison by Major Industries

(Unit: %)

FER -Review	Total -Average	IMF Crisis	1nd Won Stable	Global Crisis	2nd Won Stable
Fixed Mobile	7.9	0.0	18.0	0.5	6.9
Auto-Car	7.8	28.8	12.6	-11.2	4.0
Oil Refining	2.3	13.1	8.8	-10.2	-0.4
Steel	1.3	10.9	20.5	-29.8	-1.6
Int' l Trade	-0.4	1.8	0.4	-0.8	-1.8
Electronics	-1.0	-1.2	5.0	-5.8	-2.7
Total	3.0	8.9	10.9	-9.6	0.8

Note: IMF crisis 1998~2000, 1st Won stable 2001~2006, Global crisis 2007~2010, 2nd Won stable 2011~2018 source: Korea the Financial Supervisory Service Dart system.

the financial statements. Some traded derivatives affect total profitability of the firms. With regard to derivatives trading, most of the profits on Korean global companies are negative. This reason is originated in insufficient understanding and excessive prediction and reservation. We analyze the above theme in order to follow and compare to the value of three oil companies as well as types of borrowing, technology and company internal culture, as non-calculated elements.

1. FER Review Estimation

Table 3 shows that three large firms belonging to the oil refining industry are investigated in finding the size of the foreign assets and liabilities for the enterprise's foreign profitability and successful global businesses throughout the entire period. The FER value of the three oil firms is positive (+) 2.3 for the whole period, which means that the oil companies have earned net foreign profit whether its net foreign assets (including foreign asset minus liabilities) are large or small. We investigate whether oil and gas companies have benefited more profit from the IMF crisis. During that period, the FER value peaked at 13.1. Such a high FER value is attributable to an increase in net foreign profit from overseas transactions due to a temporary rise in the exchange rate. On the other hand, during the global crisis, the FER value was -10.2 negative; that time was also during the exchange rate uprising. During that period, the amount of losses in overseas transactions between A and B companies was tremendous, and this is because that company overbought the payable limit at a high exchange rate. The growth rate of the FER value was 552.5 percent in the period of stabilization of the Won value. This high growth rate is based on low exchange rate volatility and accurate management of the foreign assets.

Table 4 shows that the FER value of the industrial representative companies is compared to estimate for the whole period. Figure 3 shows that the FER value graph of each representative company is differentiated by specific analysis period. Oil companies

Fig. 4. FER Value Trends on Some Industries 1998~2018

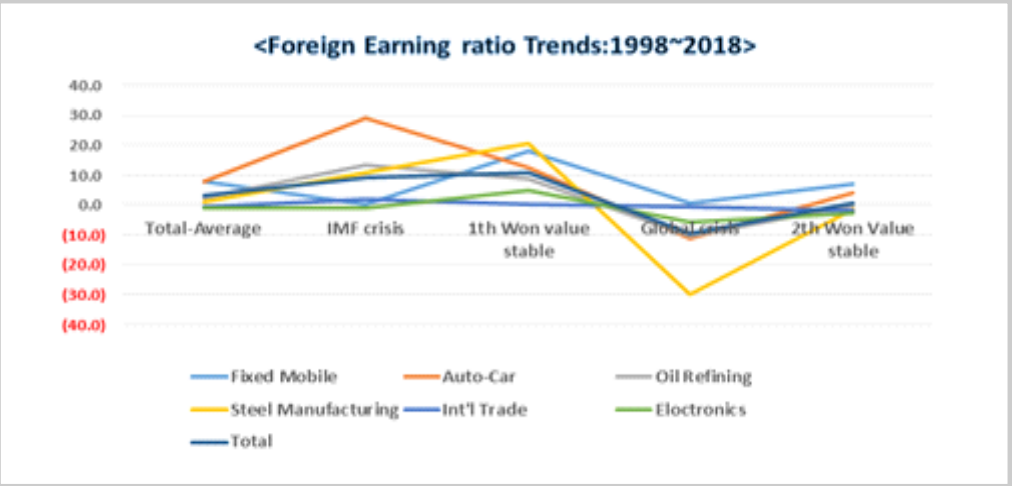


Table 5. Foreign Translation Profit Trends on Oil & Gas Firms

(Unit: Million Won, %)

Composing	Total	IMF Crisis	1st Won Stability	Global Crisis	2nd Won Staility
Translation Loss	88,199	45,866	39,376	216,821	76.379
Translation Gain	76.379	81,809	81,809	81,809	71,324
Net Translation Profit	35,775	35,775	30,598	125,075	-5,056
Net Translation Profit Growth	-197.6	-22.4	-223.0	-223.0	-176.6
Net Profit	574,188	174,477	608,121	706,116	706,116
Net Profit Growth	88.3	88.3	178.4	112.1	7.6

Note: IMF crisis 1998~2000,1st Won stability 2001~2006, Global crisis 2007~2010, 2nd Won stability 2011~2018

source: Korea the Financial Supervisory Service Dart system.

have earned only 3% revenue from foreign asset net exposure over the past two decades. The FER value of the IT & auto-motor industry is up to 7.9%. Its efficiency compares to other industries' value and has been verified. High FER value means timely management of exchange rate exposure risk and low-interest financing. During the analysis period, most companies' FER value was marked by low levels during the financial crisis. The reason for that is that foreign asset profitability was deteriorated due to the repayment of high interest costs' expense at high exchange rate. Throughout the analysis period, the value of the electronics & trade company FER is negative (-); that company has exposed global business risk (margin down, etc.) rather than

Table 6. Derivatives Profit Valuation on Oil & Gas Company

(Unit: Million, %)

Division	Total	IMF Crisis	1st Won Stability	Global Crisis	2nd Won Staility
Net Derivative Profit	6,142	-	-1,620	40,775	-3,051
Net Derivative Profit Growth	-277.0	0.0	-689.8	406.0	-412.9
Net translation profit Growth	-197.6	-22.4	-223.0	-283.6	-176.6
Net Profit	574,188	174,477	608,122	706,116	632,667
Net Profit Growth	88.3	62.4	178.4	112.1	7.6

Note: IMF crisis 1998~2000,1st Won stability 2001~2006, Global crisis 2007~2010, 2nd Won stability 2011~2018

source: Korea the Financial Supervisory Service Dart system.

the exchange rate risk. Some negative foreign profit stem from unnecessary translation risk for exceeding the holding limit.

Table 5 shows that non-realistic foreign translation profit is compared by the fourth specific period. The translation gain of the total analyzed companies was 123 billion won; its tremendous amounts was attributed to Won value which was temporary weakened during the IMF crisis & financial crisis. Net translation profit during the global shock was adversely positive; that reason was related to excess foreign debt of most Korean companies. After the global crisis, this net translation profit was negative due to a decrease in foreign liabilities. Translation loss affects the company's total profitability and credit rating. Global companies need to maintain indispensable foreign asset size.

Table 6 compares derivatives profits & growth of the companies with the specified period analyzed. Korean oil companies have earned negative profit from derivatives trading for the 20 years. This stems from a excess payable hedge position. During the global crisis, the net derivatives profit is estimated at a positive value, which stems from a temporary devaluation of the Won. The revenue of a derivative is derived on an appraisal basis, not on a real transaction base. Derivatives' trading profits is affected by the market factors such as exchange rate volatilities, not by the hedging instruments. Hedging derivatives of the oil companies are mainly futures and swap contracts within 3 years, mainly targeting foreign fund covering.

Table 7 describes the derivatives that Korean oil refiners have used to avoid exchange rate risks and volatility in crude oil prices. Oil companies mainly have used commodity derivatives to hedge fluctuation risk of the crude oil price compared to other derivatives since the 2010s. The total number of transactions of oil product derivatives reached 1,542 from 2010 to 2019. It has been found that Korean global firms used forward derivatives to reduce exchange rate risk in the case of KRW value depreciation compared to KRW appreciation periods. Types of the forward derivatives were mainly

Table 7. Derivatives Operations Status of the Oil Refinery Companies (2008~2019)

Unit: Numbers

Items	KRW Devaluation	Strong Revaluation	Weak Revaluation	Remarks
a. Fwd buying	105	82	56	Lliability hedge
b. Fwd Selling	40	52	74	
Sub Total	145	134	130	
c. Swap Buying	19	40	4	Debt hedging
d. Swap Selling	-	73	127	Interest rate hedging
Sub Total	19	113	131	
e. Commodity Futures Buying	216	826	702	Oil price hedging
f. Commodity Futures Selling	191	716	557	Stock hedging
Sub Total	407	1,542	1,259	
g. Options			15	Oil price hedging
Grand Total	571	1,789	1,535	

Note: Devaluation 2008~2010, strong revaluation 2011~2014, weak revaluation 2015~2019.
source: Korea the financial Supervisory Service Dart System (Three Oil companies).

buying deals that reduce exposure risk to foreign debts. Swap derivatives were used within one year to hedge the interest rate gap between fixed-rate and floating rate debt (liabilities). Some oil companies used currency swap buying deals to hedge the exchange rate risk of the long-term, large-scale debts. Oil refinery companies have used a total of 3,895 derivatives in the last 12 years (2008~2019). Through a survey on the use of derivatives, it was found that global managers of the oil companies have recognized that profitability of oil refinery businesses have more affected crude oil price volatility and the situation of the reserve stock index than exchange rate risk.

Table 8 describes how the oil refineries' derivatives maturity, transactions amount, number of transactions and dealing institution were structured. The average maturity of the swap derivatives and the transaction per units were found to be more than 3 years and more than 200 million dollars. Despite the won value's depreciation, most of the derivatives at the oil refinery companies are related to the hedging fluctuations in crude oil prices. A survey of actual cases shows that many Korean global companies, including oil refiners, were not sensitive to introducing and using diversified hedging instruments to reduce exchange rate risk. The total number of derivatives in the

Table 8 Individual Oil Company Derivatives in the Sub-Prime Crisis (2008)

Company	Derivatives	Buy/Sell	Amounts	Term	Remarks
A	Currency Swap	sell	1,250 mill usd	3years	F4, D1
	Interest Swap	Buy	100 mill usd	3month	D2
	Commodity Swap	Buy	585 bill usd	6month	F6
		Sel	465 bill usd	6month	F10
B	Currency Swap	Buy	120 mill usd	10 years	F3. D1
		Sell	1.28 trill won	10 years	F1. D1
	Forward	Buy	15.5 bill usd	4month	F24
	Commodity Swap	Sell	200 mill bl	9month	F10
		Buy	423 mill bl	9month	F23
C	Forward	Buy	350 mill usd	6month	F8, D5
	Interest Swap	Buy	120 bill won	1 years	D1
	Commodity Swap	Buy	100 mill usd	6month	D1

Note: A, B, C (Oil Refinery sample firms, F (foreign banks), D (domestic banks).
source: Korea the financial Supervisory Service Dart System (Three Oil Companies).

sub-prime crisis period (2008) is no different compared to the total coefficients in other periods. Korean global companies should keep optimal foreign debts which maintain a decrease in fund opportunity losses by forecasting the actual size of needing foreign assets in various ways.

Ⅴ. Conclusion

This analysis mainly studies how the net foreign assets of oil and gas companies affect foreign profit underlying the foreign financial data. This method is investigated on annual financial data. This method is simple and illogical in the statistical data. In analyzing trends in the foreign assets and liabilities, the oil companies surveyed are investigated minus the foreign asset position, and the range from foreign assets to the liabilities portion is − 200% to −500%. For a long period, oil companies had booked over the liabilities position, this is the reason why that firms generate negative profit in case of the market shock and sudden depreciation of the won. In the analysis of the foreign profit, its composition is consisted of foreign exchange gain (loss) on actual base and foreign translation gain (loss) on non-actual base, and the ratio of the foreign exchange profit against foreign translation gain is ranged from 365% to 1,038%. The translation profit volume against total foreign profit declined at the end of the analysis period in which the value won remained stable. In our special research portion of the paper, the value of FER has an important meaning; its value is implied in that its comparative index evaluates how the size of the foreign asset is linked to corporate total profitability.

High FER value companies and industries

are appraised to manage foreign asset management and identifying exchange rate risk to market environment and company competency. The result of an oil company's FER value varied from -0.3 to +2.3 over the entire period. FER values in some industries are positioned −1.0 to 7.9. This analyzed FER value results is somewhat volatile and irregular, which is not reflected in the industry for the standard comparative index. In further studies, there is more solid empirical data collection. In addition to the logical base the FER results have been more objective and signaled to the financial manager than before. The other research highlight point is an investigation focusing on the borrowing methods, CEO and employee's comprehensive capabilities for exposure risks to exchange rate, and various stakeholders' relationship. Another research point that is investigated is making use of foreign banks for a long time. This biased foreign banking relationship is related to negative profitability in the event of crisis. The foreign business companies need to prepare for a contingency credit limit plan on diversified banking relationships in the event of market failure. Foreign business firms should consider daily factors to maintain a stable FER value and reduce exchange risk by taking factors into accounts every day. First, exposure limits are maintained by conducting an accurate assessment of the actual base and participation of all departments. Second, global firms need to use a variety of hedging instruments including netting and counter trade without additional funding to minimize exchange risk. Global financial managers are reminded that the amount of the exposed assets should be minimized except for significant limits that prevent profitability. Third, more than two funding banks, excluding foreign banks, should be used to reduce interest costs and solve the problem of insufficient limits in the event of a financial crisis. Diversifying banking channels in times of economic crises changes the direction of utilizing several banks (oriental practice culture). Fourth, employees need to be committed to recognize and assess their foreign risk-exposed assets at each performance stage including the beginning schedule. Fifth, global business firms take into account uncontrolled environment factors that affect overall performance of global firms, which are economic prospectus, financial forecasting and customer status. Global firms must maintain sufficient sales volume achieved through stakeholder relationships and new marketing developments to hedge exposure risk on strategic perspectives.

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