Initial Public Offerings of Energy Companies in Japan

by

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Abstract

Initial Public Offerings (IPOs) of Energy Companies in Japan

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This paper analyses the mispricing of 20 energy, utility and natural resources IPOs in Japan from the year 1998 to 2009. The study confirms that the offer price and issue size have positive relationship with the IPO underpricing. It finds that the underwriter's gross spread is positively related to the degree of underpricing as well. Also, the study suggests that the firm's age, underwriter's reputation, listing exchange are inversely correlated with the stocks' initial return. It also explores that the IPOs listed after 2007 global financial crisis tend to have lower returns than those listed before/in 2007.

Chapter 1

Introduction

1.1 Background

1.1.1 Overview of Initial Public Offerings (IPOs)

IPOs refer to the sale of a private company's stock to institutional and individual investors for the first time. This can be traced back to the Roman Republic and sprang up at the end of 1990s' in the U.S. stock market during the Dot-com bubble. Nowadays, IPOs have become a common avenue for companies to go public worldwide. Through IPOs, companies are allowed to raise capital from investors in open market to use for future expansion.

There are three main parties engaged in the procedure of IPOs: the issuing company, the initial subscribers and the underwriters. In general, an underwriter is an investment-banking firm to assist the issuing company to carry out an IPO. It is the duty for underwriters to assure the success of this fund gathering activity by providing

services including firm valuation and IPO pricing etc. In this transaction, the investors

aim at realizing a reasonable return to compensate a particular level of risk. While the

issuers seek to lower the level of underpricing to collect as much capital as possible.

The underpricing of IPOs is a financial issue discussed by many scholars for decades.

It is the phenomenon when the issuing company's stock price is lower that its closing

price on the first day of listing on the stock exchange.

1.1.2 Japanese Energy Sector

Japan is a country lacking several core energy resources such as coal, crude oil and

natural gas due to its restricted national territorial area and limited natural

environment. However, along with its accelerated development in heavy industry after

World War II, Japan accordingly becomes one of the top fossil fuel importing

countries to satisfy its huge demand of energy consumption. On the other hand, Japan

has a significant weight in electricity production in the world. According to CIA

World Factbook 2008, with less than 2% of the world's population, Japan ranked forth

of electricity production with 1,025 TWh generated in year of 2008.   What is worth

noting is that the cost of electricity is comparatively expensive in Japan. Especially

after the cut off of nuclear power caused by the 2011 Fukushima earthquake and tsunami disaster, the expenditure of electricity jumped sharply.

1.2 Purpose of Study

In this paper, the study will discuss whether energy IPOs in Japan are seen to be underpriced and the degree of underpricing from January 1990 to December 2012 including the period of 2008 worldwide financial crisis and 2011 Tōhoku earthquake and tsunami. Another purpose of the study is to investigate what factors and uncertainties have high correlations with the underpricing of energy IPOs in Japan. As clarified above, as one of the largest energy resources importer with significant amount of electricity production & consumption, it makes Japan a highly valuable market to study the IPOs of Energy companies.

1.3 Need for Study

IPOs are treated as a risky investment for investors since there are many uncertainties such as information anomaly in IPOs. The results of this study strive to give

subscribers the theoretical mean underpricing returns of energy IPOs in Japan under

specific assumptions. For issuing company, the paper also observes the properties of

offers and features of different roles in the activity that may be relevant to the degree

of underpricing so as to help issuers to decrease the effects of underpricing to IPOs.

Moreover, the study may be useful for underwriters to give better suggestions to both

subscribers and issuers. Since the underwriters want to sell properly priced stocks to

their investors clients but also try to maximize the capital gathered from the market

for their issuer clients at the same time so that they can receive more benefit from

these transactions.

1.4 Limitation of Study

Since the paper restricts the study in Japanese energy sector which contains small

sample size of companies matching the conditions, it may lead to a relatively large

deviation from the exact values.   Also, after the decrease of nuclear energy, there are

more uncertainties but also opportunities for Japanese energy industry. The

conclusion obtained today may be needed further discuss after new information

released to the market.

1.5 Organization of Paper

The paper consists of five sections. In chapter 1, the paper gives a brief introduction

to the background and overview of energy IPOs in Japan, purpose and need of the

study, and the limitation of study as well. In chapter2, the paper demonstrates the

previous study by other scholars. Based on their conclusions, the paper can be

improved to be more comprehensive and convincing. In chapter3, there is the

methodology analysis with specific model used to investigate the problems along with

a test to detect the appropriateness of the model. The following section will present

the results of the analysis and discuss further. In the last chapter, the final conclusion

and recommendation are advanced to wrap up the paper.

Chapter 2

Literature Review

2.1 Theoretical Explanations for Underpricing

As far back as 1980's there have been various interpretations of IPO underpricing held by several scholars. Most of them either insists that it is the issuing company and underwriter make IPO underpriced intentionally or present that it is the subscriber underestimate the issue. Hereby, this study picks six theories behind underpricing to provider a comprehensive explanation. The first three theories are attributed to the problem of information asymmetry. However, Ritter and Welch (2002) suggest that asymmetric information may not be the primary driver of IPO underpricing. The last three theories are referred to the issues of investor behavior, the entity control and the legal liability.

2.1.1 Winner's Curse

It is said in the hypothesis that investors are split into the informed and the uninformed due to the information asymmetry in the imperfect market. Rock (1986) finds that the informed ones have advantages to value companies accurately so as to seek for more profitable stocks. However, he argues that, the investors with less information about the fair value of shares usually subscribe IPOs equally and received much less amount of valuable shares than the informed. After the uninformed recognize this winner's curse they will reduce the subscribing amount or even exit the market. Therefore, the issuing company has to underprice IPO to compensate the uninformed with a premium.

2.1.2 Underwriters' Monopoly Power

According to Baron (1982), the entity prefers the investment bank to determine the issue price. Because not only the investment bank masters superior information about the capital market conditions by its monopoly power, but also the issuer is not able to supervise the counterparty perfectly due to high monitoring costs. He suggest that, the investment bank will set the issue price with a discount on purpose in order to assure

the success of issuance, to decrease the risk of underwriting and build better

reputation among investors as well. A reasonable degree of underpricing can align the

interests of the issuer and underwriter and allow the entity to avoid problems of moral

hazard and adverse selection.

2.1.3 Signaling

This hypothesis is referred to the information asymmetry between issuing company

and investors. Allen & Faulhaber (1989), Grinblatt & Hwang (1989), Welch (1989)

report that the company with good quality will issue underpriced IPO to signalize

investors in order to have a better performance in the secondary market and a higher

condition in the subsequent emission. Because after investors collect more

information about the company they will realize the true value of the stock and be

willing to pay higher price in the subsequent emission which will compensate the loss

from underpricing for the issuing company. Allen (1989) document that the

significant amount of dividend distribution is considered as a signal. And Grinblatt &

Hwang (1989) identify the number of outstanding shares owned by prior shareholder

as a signal to other investors.

On the other hand, Welch (1989) advances that the good quality companies can be distinguished from low quality companies, which have the intention of signaling since the imitation cost is too high for them to take the risk.

2.1.4 Bandwagon Hypothesis

Welch (1992) believes the investors' purchase of IPOs is a dynamic process instead of a point in time. The decision the made not only depends on the information they collected but also badly influenced by other investors. The bandwagon behavior indicates that if one stock is popular in the market, investors will subscribe large amount of shares regardless of the company's information they already hold. He argues that, the issuing company can provide underpriced IPO to grasp a few potential investors and then attract others' to participate in the subscription so as to assure the successful issuance because of the bandwagon behavior.

2.1.5 Ownership Dispersion Hypothesis

Brennan & Franks (1995) examine that the underpricing is induced by the executive officers to generate excess demand. The subscribers can only obtain the amount of

shares prorated. It prevents the stock from significantly holding by minority

individuals. The executives can retain the control of the company and it increases the

liquidity of the stock and reduces the risk of takeover (Brennan & Franks 1995).

2.1.6 Lawsuit Avoidance

The hypothesis is put forward by Tinic (1988) by the comparisons of degree of IPO

underpricing before and after the publishing of Truth in Securities Law in 1933 in U.S.

Because there are strict regulations of information disclosure to protect investors,

when the stock price keeps falling the entity and underwriter may be sued in

connection with the false content in the IPO prospectus or undisclosed company

information by its investors. Therefore, the issuers especially those are subject to

litigation risk usually underpricing IPO to reduce the likelihood of being charged.

2.2 Factors Influencing Underpricing

There are several elements to be examined of the statistically significant correlation

with the degree of underpricing in this paper. Some of them such as the offer price,

issue size, age and underwriter's reputation have been commonly used in related studies.

In the study of 649 U.S. IPOs during 1975 to 1982 by Chalk and Peavy (1987), the average initial return for the group of IPOs priced at or below $1 is about five times more than that for the next higher priced group. However, Hanley (1993) studies the correlation of IPO underpricing to the offering price by using the Red Herring prospectus price range and finds if the price is beyond the upper boundary of the offering range by their underwriters, there is a greater degree of underpricing.

Beatty and Ritter (1986) suggest the issue size is a proxy for ex ante uncertainty, which afflicts the future performance of shares. Also they argue that the IPOs with smaller size have more likelihood to be underpriced than that with larger size. They support the opinion by using 1028 US IPOs from 1977 to 1982. According to Ibbootson, Sindelar, and Ritter (1994), if the issue size is greater, there is the less uncertainty surrounding the issue, and then the degree of underpricing is lower. Durukan (2002) also confirms that the gross proceed is negatively related to underpricing by studying the returns of IPOs in the Istanbul Stock Exchange.

The age of a company is also an influential factor that negatively correlated to underpricing. Muscarella (1989) reports that the younger and start-up companies tend to have higher degree of underpricing than those mature and stable ones.

The underwriter reputation is a factor influencing the IPO underpricing. Carter and Manaster (1990) state if the underwriter participate in more issues, there is less uncertainty surrounding the issue, and then the offering would be less underpriced. Dimovski and Brooks (2004) observed 358 Australian industrial and mining company IPOs during1994 to 1999 to state that more IPOs returns generated for issuers with underwriters than those without underwriters. Loughran and Ritter (2004) report that there is a negative relation between underwriter reputation and DUP in the 1990s in U.S. Also, the type of exchange is also significant to underpricing. The more stringent the listing requirement is on the exchange, the greater the reputation of the exchange, and the less degree of underpricing for the listed IPOs.

Kini (1995) argues that the bid-ask spread (BAS) is a dominant positively related to the IPO underpricing. BAS is the ask price of a stock less its bid price. The relative bid-ask spread (RBAS) is also introduced to capture the degree of uncertainty of the

issue. The RBAS is the margin between the ask price and the bid price divided by the bid price.

2.3 IPOs in Japan

Ritter (2013) studies the IPOs performance for both short-term and long-term horizons in many countries. He presents a list of different degrees of IPOs underpricing in different regions summarized form reports by other researchers. He reports an average initial return of 40.2% for 3136 IPOs during the year1970 to 2011 in Japan. He argues that the degree of underpricing in the short-run in East Asian countries such as Japan is reduced in 1990s from 1980s by less regulatory interference on offerings price setting. Also, he claims that the IPOs in Japan are sensitive to the uncertainty of the consideration of tiny issues and the use of closing price on the first trading day.

From Table 2.3, it is apparent that most of the initial returns for developed countries such as Canada, U.S., and U.K. are fairly lower than the emerging countries such as Saudi Arabia, China and India. However, as the most developed country in Asia,

Japan has a relatively high average initial return of 40.2% than other western

countries.

Table 2.3 Equally weighted average initial returns for 50 countries

Country	Source	Sample Size	Time Period	Avg. Initial Return
Argentina	Eijgenhuijsen & van der Valk	20	1991-1994	4.4%
Australia	Lee, Taylor & Walter; Woo; Pham; Ritter	1,562	1976-2011	21.8%
Austria	Aussenegg; Ritter	102	1971-2010	6.3%
Belgium	Rogiers, Manigart & Ooghe; Manigart DuMortier; Ritter	114	1984-2006	13.5%
Brazil	Aggarwal, Leal & Hernandez; Saito; Ushisima	275	1979-2011	33.1%
Bulgaria	Nikolov	9	2004-2007	36.5%
Canada	Jog & Riding; Jog & Srivastava; Kryzanowski, Lazrak & Rakita; Ritter	696	1971-2010	6.7%
Chile	Aggarwal, Leal & Hernandez; Celis & Maturana; Ritter	65	1982-2006	8.4%
China	Chen, Choi, & Jiang; Jia & Zhang	2,102	1990-2010	137.4%
Cyprus	Gounopoulos, Nounis, and Stylianides; Chandriotis	73	1997-2011	20.3%
Denmark	Jakobsen & Sorensen; Ritter	164	1984-2011	7.4%
Egypt	Omran	53	1990-2000	8.4%
Finland	Keloharju	162	1971-2006	17.2%
France	Husson & Jacquillat; Leleux & Muzyka; Paliard & Belletante; Derrien & Womack; Chahine; Ritter; Vismara	697	1983-2010	10.5%
Germany	Ljungqvist; Rocholl: Ritter; Vismara	736	1978-2011	24.2%
Greece	Nounis, Kazantzis & Thomas; Thomadakis, Gounopoulos & Nounis	373	1976-2011	50.8%
Hong Kong	McGuinness; Zhao & Wu; Ljungqvist & Yu; Fung, Gul, and Radhakrishnan; Ritter	1,259	1980-2010	15.4%
India	Marisetty and Subrahmanyam; Ritter	2,964	1990-2011	88.5%
Indonesia	Suherman	410	1990-2012	25.7%
Iran	Bagherzadeh	279	1991-2004	22.4%
Ireland	Ritter	31	1999-2006	23.7%
Israel	Kandel, Sarig & Wohl; Amihud & Hauser; Ritter	348	1990-2006	13.8%
Italy	Arosio, Giudici & Paleari; Cassia, Paleari & Redondi; Vismara	273	1985-2009	16.4%
Japan	Fukuda; Dawson & Hiraki; Hebner & Hiraki; Pettway & Kaneko; Hamao, Packer, & Ritter; Kaneko & Pettway	3,136	1970-2011	40.2%
Jordan	Al-Ali and Braik	53	1999-2008	149.0%
Korea	Dhatt, Kim & Lim; Ihm; Choi & Heo; Mosharian & Ng; Cho; Joh; Ritter	1,593	1980-2010	61.6%
Malaysia	Isa; Isa & Yong; Yong; Ma	413	1980-2009	62.6%

Country	Source	Sample Size	Time Period	Avg. Initial Return
Mauritius	Bundoo	40	1989-2005	15.2%
Mexico	Aggarwal, Leal & Hernandez; Eijgenhuijsen & van der Valk	88	1987-1994	15.9%
Netherlands	Wessels; Eijgenhuijsen & Buijs; Jenkinson, Ljungqvist, & Wilhelm; Ritter	181	1982-2006	10.2%
New Zealand	Vos & Cheung; Camp & Munro; Ritter	214	1979-2006	20.3%
Nigeria	Ikoku; Achua	114	1989-2006	12.7%
Norway	Emilsen, Pedersen & Saettem; Liden; Ritter	153	1984-2006	9.6%
Philippines	Sullivan & Unite; Ritter	123	1987-2006	21.2%
Poland	Jelic & Briston; Woloszyn	309	1991-2012	13.3%
Portugal	Almeida & Duque; Ritter	28	1992-2006	11.6%
Russia	Ritter	40	1999-2006	4.2%
Saudi Arabia	Al-Anazi, Forster, & Liu	76	2003-2010	264.5%
Singapore	Lee, Taylor & Walter; Dawson; Ritter	591	1973-2011	26.1%
South Africa	Page & Reyneke; Ali, Subrahmanyam & Gleason; Ritter	285	1980-2007	18.0%
Spain	Ansotegui & Fabregat; Alvarez Otera	128	1986-2006	10.9%
Sri Lanka	Samarakoon	105	1987-2008	33.5%
Sweden	Rydqvist; Schuster; de Ridder	374	1980-2011	27.2%
Switzerland	Kunz, Drobetz, Kammermann & Walchli; Ritter	159	1983-2008	28.0%
Taiwan	Chen	1,312	1980-2006	37.2%
Thailand	Wethyavivorn & Koo-smith; Lonkani & Tirapat; Ekkayokkaya and Pengniti	459	1987-2007	36.6%
Turkey	Kiymaz; Durukan; Ince; Kucukkocaoglu	355	1990-2011	10.3%
United Kingdom	Dimson; Levis	4,877	1959-2011	16.1%
United States	Ibbotson, Sindelar & Ritter; Ritter	12,340	1960-2012	16.8%

Source: Loughran, Ritter, and Rydqvist (1994), Ritter (2013).

2.4 Previous Energy and Utility IPO research

There is little research relevant to energy IPOs in Japan. However, Dimovski (2013)

analyses 158 energy company IPOs from 1994 to 2010 in Australia that is rich of

natural resources. In the study, he finds that energy IPOs have an average 22%

underpricing in Australia. Also, he argues that the issue size and underwriter's

reputation have a crucial relation with the IPO underpricing. Besides, he examines

that the global financial crisis in 2007 does not seem to affect the underpricing

significantly in the research.

Chapter 3

Methodology

3.1 Sources of Data

Most of the information of selected companies is gathered from the website of Tokyo

stock exchange and Kaneko and Pettway's Japanese IPO Database which contains

dataset of Book-building IPOs in Japan. Thomson Reuters Datastream and Yahoo

Finance is also assistant to observe the companies' initial total capital, underwriters

spread proceed prior to the IPO and the historical price of market index Nikkei 225.

The measuring currency is Japanese Yen in the paper.

3.2 Sampling design

In this paper, the sample excludes companies already delisted from the stock

exchanges for the purpose of convenience during the observation. Also, it focuses on

IPOs by using book-building method that is efficient for price discovery. In order to

reduce bias, utility IPOs and natural resource IPOs are combined with energy IPOs to

have a comparatively large sample size. In the Table 3.2, it presents the distribution of

the sample in different industries. There are total 134 companies in energy, utility and

natural resources sectors in Japan. Because the focus is on the book-building IPOs,

the IPOs using hybrid auction method are excluded in the sample. Also, since the

information for some companies is too old to be observed, 20 companies' offerings

during 1998 and 2009 are finally selected in this study.

Table 3. 2: Sampling distribution in each industry

Industry	Total IPOs	Sample size
Oil & Petrochemicals Products	13	2
Electricity & Gas	25	5
Iron & Steel	51	2
Non-ferrous metals	37	8
Mining	8	3

3.3 Methods and Models

3.3.1 Degree of Underpricing (DUP)

The DUP can be investigated by examining the initial period return of each stock i

(IPR_i) which is the ratio of the margin between the share's closing price on the first

listing day (P_{i1}) and the offer price (OP_i) to the offer price (OP_i).

$$DUP \equiv IPR_i = (P_{i1}\text{-}OP_i) / OP_i \qquad\qquad (3\text{-}1)$$

From the result,

If $P_{i1}\text{-}OP_i$ is greater than zero, the issue is underpriced.

If $P_{i1}\text{-}OP_i$ is equal to zero, the issue is correctly priced.

If $P_{i1}\text{-}OP_i$ is less than zero, the issue is overpriced.

3.3.2 Market-adjusted DUP (ADUP)

The ADUP is obtained by DUP less the return of market index on IPOs' first day of

listing (R_{im}).

$$ADUP \equiv DUP\text{-} R_{im} \qquad\qquad (3\text{-}2)$$

In the paper, Nikkei 225 is used as a measurement of market index because it is

price-weighted and consists of 225 stocks in all industries including energy, utility

and natural resource. The market return is calculated by the closing price of Nikkei

225 on the first listing day of stock i (N_{i1}) minus the closing price of Nikkei 225 on

the day prior to the IPO of stock i (N_{i0}), the result of which is then divided by the N_{i0}.

$$R_{im} = (N_{i1} - N_{i0}) / N_{i0} \qquad (3\text{-}3)$$

3.3.3 Ordinary least squares regression (OLS)

First, an OLS model is employed to investigate the correlations between initial period

return and its influential elements. The dependent variable is the initial return

(IN_RETURN) and the independent variables are defined as following:

- Offer price (OP)

- Issue size $\equiv$ Logarithm of the total capital raised (LnTCR)

- Logarithm of the age of the company (LnAge)

- Underwriter's gross Spread (UGS)

- The reputation of underwriting (D_ROU): it is a dummy variable equal to 1 if its

  underwriter is one of the top three in the rank of underwriters and securities

  firms by Kirkulak and Davis (2005), and it is 0 if others.

- Type of Exchange (D_EX): this is a dummy variable indicating if the stock is

  listed on TSE (1) or others (0).

- 2007 Global financial crisis (D_2007): this is also a dummy variable reflecting if

  the IPOs were listed after 2007 (1) or before/in 2007(0).

Most of these factors have been examined to be applicable in explaining the

underpricing return by researches displayed in the literature review.

The regression model is:

$$RETURN = \beta_0 + \beta_1 OP + \beta_2 LnTCR + \beta_3 LnAge + \beta_4 UGS + \beta_5 D\_ROU$$

$$+ \beta_6 D\_EX + \beta_7 D\_2007 + \varepsilon \qquad (3\text{-}4)$$

The betas are unknown parameters to be estimated and the error term is assumed to

follow the normal distribution $\sim N(0, \sigma^2)$.

3.3.4 Heteroskedasticity Detecting

3.3.4.1 Classical Assumptions

There are several important assumptions established for the classical OLS regression.

It includes no autocorrelation, no perfect collinearity and the Homoscedasticity.

For autocorrelation, it is the cross-correlation of the error terms in contiguous time

periods. It will lead to the autocorrelation of dependent variables and usually appears

in the regression using time series data. It is presented as:

$$Cov\ (\varepsilon_t,\ \varepsilon_{t-s}) \neq 0 \qquad (3\text{-}5)$$

The multicollinearity is the correlation between each independent variable. It is

detected when the regression has a result of high R square but few significant t-ratios.

It is present as:

$$X_{3i} = \alpha X_{2i} \qquad (3\text{-}6)$$

The Homoscedasticity means the variance of the error term is constant. It is expressed

as following:

$$Var\ (\varepsilon_i) = \sigma^2 \qquad (3\text{-}7)$$

This is the counterpart of Heteroskedasticity that the variance of error term is not

constant:

$$Var\ (\varepsilon_i) = \sigma_i^2 \qquad (3\text{-}8)$$

In this paper, since cross-sectional data is used in the regression, the model is tested in

terms of heteroskedasticity.

3.3.4.2 Consequences of Heteroskedasticity

First, the OLS estimators are not best linear unbiased (BLUE). It makes the estimators lose the property of efficiency. Second, the hypothesis testing can be misleading even if Heteroskedasticity is recognized. Third, the accuracy of hypothesis testing is affected because with Heteroskedasticity the OLS formulate for standard error is incorrect.

3.4.3 Formal detective tests

Breusch-Pagan-Godfrey (B-P-G) test and White general test can be employed to the detection of Heteroskedasticity. In this study, the White test is applied since it work well for non-linear forms of heteroskedasticity and does not depend on the normality of error term ε_i which is assumed in the B-P-G test. In the White test, the first step is to estimate the model and obtain the estimated residue $\hat{u}_i$. Second, we run a regression of the square of the estimated residue $\hat{u}_i^2$ on the X variables, on their squares, and on their cross products, which are joint variations. Then we make the hypothesis with null hypothesis of homoscedasticity and alternative hypothesis of not homoscedasticity. Under the null hypothesis, the value of NR^2 follows the distribution

of Chi-square ~ $\chi^2_{D.F.,}$ where N represent the number of observations in the regression

of the square of the estimated residue $\hat{u}_i^2$, R^2 is the R-square from the regression of $\hat{u}_i^2$

on X variables, and the D.F. represents the degree of freedom. The null hypothesis is

rejected when NR^2 is greater or equal to the critical value of $\chi^2_{D.F,}$ α, where α represent

the confidence level.

Chapter 4

Results and Analysis

4.1 Display of ADUP results

In Table 4.1, it lists the initial returns and market-adjusted degree of underpricing for each IPO in the sample. Almost all the IPOs generate abnormal return ranged from 2.05% to 217.19% compared to the market index (Nikkei 225) except for the IPO of OSAKA Titanium Co. with a negative ADUP of 9.42%. The IPO of First Energy Co. generate the highest initial return of 217.3% and market-adjusted DUP of 217.19%. For Asaka Riken Co., even if the company initial return is negative 4.4%, but the market-adjusted return is positive 2.16%. It indicates that its IPO would be slightly underpriced if it were offered in an average performed or bullish market. From this table, it is obvious that the issue of IPO underpricing exists in the stocks of energy, utility and natural resource industry in Japan.

Table 4.1 Results of IPOs' ADUP

Company Name	DUP	ADUP	Company Name	DUP	ADUP
Nippon Mining &	19.6	20.51	ASAHI	75.0	74.96
Shinnihon Gas	29.3	28.53	Furukawa-Sky	22.2	20.23
Asahi Pretec	75.8	75.61	HIRAKAWA	35.3	33.99
Shizuoka Gas	52.6	53.14	NIC Autotec	34.9	34.99
OSAKA Titanium	-7.4	-9.42	Idemitsu Kosan	13.4	13.42
Matsumura Oil	11.6	10.54	KYOEI STEEL	16.5	17.55
HIGASHINIHON GAS	31.5	31.38	FCM	42.9	45.70
Electric Power	3.0	2.05	Asaka Riken	-4.4	2.16
INPEX	18.1	18.34	Japan Drilling	45.5	45.66
The First Energy	217.3	217.19	Japan Petroleum	14.3	16.40

4.2 The characteristics analysis of variables

Table 4.2 reports the summary statistics for the IPOs underpricing in energy, utility

and natural resource sectors in Japan from Year 1998 to 2009. It describes the

characteristics for each variable including initial return, offer price, the logarithm of

issue size, the logarithm of firm's age, the underwriter's gross spread and three

dummy variables of underwriter's reputation, the listing exchange and the listing time

before of after the 2007 global financial crisis.

Table 4.2 Summary statistics for the data set

Variable	Obs	Mean	STD.Dev.	Min	Max
IR	20	37.35	47.99141	-7.4	217.3
OP	20	270328.8	755700.5	167	3300000
lnTCR	20	22.33876	2.216246	18.9335	26.6496
lnAge	20	3.466547	0.805974	1.568616	4.517431
UGS	20	5.837167	1.623751	2.5	8
D_ROU	20	0.8	0.4103913	0	1
D_EX	20	0.6	0.5026247	0	1
D_GFC	20	0.1	0.3077935	0	1

From the table above, the initial return ranged from negative 7.4% to 217.3% with the

mean being 37.35%. This average return is close to the one of 40.2% for 3120 IPOs in

Japan summarized by Ritter (2013) in his study. Even if there exists an IPO with an

unusual negative return, which means the stock is overpriced and the subscription

price is higher than the stock's closing price on the first listing day. The high average

first-day return indicates the energy IPO underpricing is a significant issue in Japan.

The average offer price of ¥270328 is much higher than the lowest one since there is a

large margin between the maximum and minimum prices and most of them have a

high offer price. The Asahi Pretec Co. offers the highest price ¥3.3million. However,

it is not the company raised the most capital from the IPO. The average total capital

raise among these companies is ¥39.1 billion and the Electric Power Development

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raises the most capital of ¥374.78 billion from its IPO. In the table, we can see the

average logarithm of the companies' age is 3.47. It indicates the mean of the age is 40

years, which shows that most of these companies have a medium to large scale. Also,

it can be inferred that the three industries are in a mature business cycle. For

underwriters' gross proceed, the mean is ¥5.84 with a range from ¥2.5 to ¥8.

4.3 OLS regression analysis

Table 4.3 down below reports the result of the OLS regression of the observed initial

return on the explanatory variables, for which the model is demonstrated in the third

part of Methodology to analysis the IPOs underpricing in energy, utility and natural

resource sectors in Japan from year 1998 to the year 2009. It applies a multiple linear

regression instead of a single factor regression in order to extend a more

comprehensive and reliable analysis.

Table 4.3 OLS regression results for the IPOs underpricing Analysis

Source	SS	df	MS				
				Number of obs =		18	
				F(7 , 10)	=	0.88	
Model	16545.0078	7	2363.57254	Prob > F		= 0.5528	
Residual	26798.4785	10	2679.84785	R-squared		= 0.3817	
Total	43343.4862	17	2549.61684	Adj R-squared		=- 0.0511	
				Root MSE		= 51.767	
IR	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]		
OP	0.0000215	0.0000197	1.09	0.300	-0.0000223	0.0000653	
lnTCR	4.199562	13.76133	0.31	0.766	-26.46259	34.86172	
lnAge	-19.73052	17.54281	-1.12	0.287	-58.81835	19.35731	
UGS	12.8157	16.59033	0.77	0.458	-24.14986	49.78126	
D_ROU	-1.428368	33.05859	-0.04	0.966	-75.0875	72.23077	
D_EX	-11.11624	38.01375	-0.29	0.776	-95.81615	73.58368	
D_GFC	-16.28261	40.79019	-0.40	0.698	-107.1688	74.60359	
_cons	-56.77667	377.6343	-0.15	0.883	-898.1982	784.6449	

From the table, the firm's age, underwriter's reputation, listing exchange and global

economic environment are inversely correlated with the stocks' initial returns. The

negative sign indicates that if the firm is younger, or the underwriter's reputation is

low, or it is not listed in TSE, or it is listed before/in the year 2007, it has a greater

degree of underpricing. Also, the offer price, issue size and the underwriter's gross

spread have a positive relation with the degree of underpricing. It means that if the

offer price is higher, or the issue size is larger, or the underwriter's gross spread is

larger, there is a higher initial return. Even if all of the independent variables generate

a t-value lower than the critical value of 2, all of their standard errors are greater than 3.5 and the P-values are all much greater than 0.05. The P-value of 0.05 shows there is a 95% confidence that the independent variables are significantly coefficient with the dependent variables.

The result shows a R-square of 0.313, which means 31.3% of the total variations in the IPO underpricing can be explained by these independent variables. Also, the test of the regression function: $F(7,10) = 0.88$, Prob (F-statistic) = 0.5528, which indicates the likelihood that the true population parameter lie outside the confidence interval is considerably high. It infers that not all independent variables have a significant effect on the degree of underpricing. The relatively low explaining power and low confidence level may be attributed to the fairly small sample size and the heteroskedasticity for the variables. Therefore, the result seems not convincing to explain the underpricing issue and the white test needs to be employed to investigate the statistical significance of the regression model.

4.4 Analysis of Heteroskedasticity Detection

Since there is a low explaining power and a low confidence interval with regard to the

amount of underpricing return, a White test needs to detect if there is the

heteroskedasticity in the regression.

According to the rule of the White test, if the value of NR^2 is greater or equal to the

critical value of $\chi^2_{D.F.,}$ α, the null hypothesis is rejected and there exists the

heteroskedasticity. The null hypothesis can be accepted when the value of NR^2 is less

than the critical value of $\chi^2_{D.F,}$ α.

Table 4.4 Result of the White test

White's test for	Ho: homoskedasticity		
against	Ha: unrestricted heteroskedasticity		
chi2(17)	=	18.00	
Prob > chi2	=	0.3888	

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	18.00	17	0.3888
Skewness	7.97	7	0.3356
Kurtosis	2.00	1	0.1578
Total	27.96	25	0.3096

In table 4.4, the result of the White test is presented to check the heteroskedasticity of

the regression. The value of NR^2 is equal to the Chi2 of 18 in the table. According to

the chi-square table, the critical value for $\chi^2_{17, 0.05}$ is 27.59.

Therefore, the null hypothesis cannot be rejected, which implicates the

heteroskedasticity does not exist in the regression model.

Chapter 5

Conclusion and Recommendation

5.1 Conclusion

This paper examined the underpricing of energy IPOs in Japan for the period from 1998 to 2009. What it found is that the average underpricing for these IPOs is 37.35%. It is broadly in line with the findings of previous studies [Dimovski (2013), Ritter (2013)]. The implication shows that investor can theoretically make profit through subscribing these energy IPOs and selling them on the first listing day. Also, after the shut down of nuclear station since 2011 earthquake and Tsunami in east Japan, there will be a few new movements in the energy and utility companies in Japan. The study might be helpful for investors to grasp the investment opportunities. On the other hand, the issuing company can take it into account to generate more accurately priced IPOs to raise more capital for its future expansion.

In this study, it explored the relations between the degree of underpricing and several factors as well. The overall results of this study support that the firm's age,

underwriter's reputation, listing exchange and global economic environment are negatively related with the stocks' initial returns. Also, the offer price, issue size and the underwriter's gross spread are positively related with the degree of underpricing. Even if the result of the regression shows these independent variables are not statistically significant to the initial return, the fairly small sample size may be the main attribution. Since after applying the White test, it is proved that the heteroskedasticity phenomenon does not exist in the regression

5.2 Recommendation

In terms of future research, since the explaining power and confidence lever are not high enough to convince the relation between the DUP and explanatory factors, the study need to collect more information about companies' IPOs to have a larger sample size, to take more factors into consideration, and to establish a more reliable model to analysis the underpricing in energy IPOs in Japan.

Also, the long-run performance of these energy IPOs after they listing on the exchange would be a useful subsequent study.

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Appendix A

Descriptive statistics for the top 24 ranked underwriters in Japan

Descriptive statistics for the top 24 ranked underwriters

Underwriter	Lead Share	Market Share	OIR	CIR	Positive OP Position	Negative OP Position	EP equals OP	Lead Underwriter	Subordinate Underwriter	Total
Nomura	62.19	40.97	39.91	39.79	128.5	60	3	191.5	252	443.5
Daiwa	59.28	27.12	49.58	49.52	125.5	18	6	149.5	391	540.5
Nikko Salomon	60.93	16.15	47.91	49.41	115.5	21	9	145.5	326	471.5
Mitsubishi	59.41	8.89	26.97	24.97	48	10	–	58	439	497
Shinko	59.55	1.91	40.98	41.87	43.5	8	4	55.5	459	514.5
UFJ Tsubasa	59.24	0.74	59.83	58.58	18.5	2	2	22.5	359	381.5
Mizuho	57.57	1.04	23.13	24.79	12	2	–	14	215	229
Tokyo	59.00	0.23	15.41	18.68	8	–	2	10	272	283
Ichiyoshi	58.10	0.41	70.79	69.72	8	2	–	10	239	249
Meiko National	59.86	0.11	53.21	44.63	5	1	1	7	183	190
Mizuho Investors	56.75	0.15	24.23	24.23	3	1	–	4	101	105
Toyo	61.25	0.08	16.46	19.79	3	–	1	4	135	139
Merill Lynch	49.00	0.36	27.00	30.00	2	–	–	2	98	100
HSBC	57.50	0.18	17.37	17.37	2	–	–	2	54	56
J.P.Morgan	50.00	0.41	8.06	6.80	2	–	–	2	13	15
Goldman Sachs	43.75	0.64	14.10	8.00	1.5	–	–	1.5	31	32.5
UBS Warburg	56.67	0.48	2.90	9.04	1.5	–	–	1.5	28	28.5
Cosmo	60.00	0.02	6.67	6.67	1	–	–	1	101	102
Commerz	60.00	0.01	−2.78	5.56	1	–	–	1	17	18
Marusan	51.00	0.02	52.94	52.94	1	–	–	1	119	120
Credit Suisse	55.00	0.03	3.85	19.23	1	–	–	1	2	3
Sakura Friend	60.00	0.02	6.67	2.89	1	–	–	1	98	99
H.S.	72.00	0.01	28.97	28.97	–	1	–	1	33	34
Wit Capital	40.00	0.01	1.25	0.94	0.5	–	–	0.5	21	21.5
Total	60.14	100	42.44	42.61	533	126	28	687		

Source: Kirkulak and Davis (2005)