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Mergers & Abenomics: The Determinants of M&A in Japan's New Economy

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Recommended Citation

Hallberg, Ethan S., "Mergers & Abenomics: The Determinants of M&A in Japan's New Economy" (2014). *CMC Senior Theses*. Paper 894.
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Mergers & Abenomics: The Determinants of M&A in Japan's New Economy

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for

SENIOR THESIS

Spring 2014
April 22nd, 2014

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Abstract

This paper investigates the influence of various macroeconomic variables on Japan's merger and acquisition (M&A) activity, both in terms of total deal value and total number of deals. Looking at monthly data from June 1997 to December 2013, I use econometric time-series analysis to find that: First, total deal value per month is not well explained by our macroeconomic variables, but about half of the variation in number of deals per month can be explained by our dataset. Second, the most important determinant in the total number of deals per month during our period is the level of national debt, and interest rates had the opposite effect from what was originally expected. Third, adding lag variables to our analysis proved to be relatively fruitless. Finally, when taking a look at only the past couple of years to determine the effects of "Abenomics" on M&A activity in Japan, I conclude that there is not enough data, and better results would be obtained in the future.

1. Introduction

Japan has experienced an extended period of slow economic growth over the last couple of decades, highlighted with China overtaking Japan as the world's second largest economy in 2010 ("Abe's Master Plan"). To battle the stagnant gross domestic product (GDP) levels and negative inflation, the Japanese government and Bank of Japan (BOJ) have instituted ultra-low interest rate, loose monetary policies with little effect (Ueda 176). In December of 2012, with the re-election of Shinzo Abe (after a failed first attempt in 2006 and 2007) as Prime Minister and appointment of Haruhiko Kuroda as Governor of the BOJ, the economy started showing signs of activity as their unprecedented

quantitative easing, fiscal spending and positive economic rhetoric has helped the stock markets soar, the end of deflation and a more optimistic economic and nationalistic spirit emerge across the nation (“Abe’s Master Plan”).

Despite economic troubles, M&A activity has been relatively healthy in Japan throughout the period. In 2012, total deal value of completed M&A deals in Japan accounted for 5% of total global deals. Particularly since the loosening of M&A related regulations in the 1990’s, the weak economy has not particularly inhibited deal flow, except for the expected drop off since the global financial crisis in 2008 (Thompson Reuters).

This paper attempts to link these two concepts: are there certain macroeconomic factors that influence deal flow in Japan? Do low interest rates, which decrease the cost of borrowing, lead to an increase in deal flow and total deal value as you would expect? Is there a difference between the most current period of low interest rates under the leadership of Abe and Kuroda and earlier attempts at reviving the economy?

First we take a look at prior literature related to my questions, and then we review the details of PM Abe’s policies and how they are different from his predecessors’. We then test my questions with multiple regression analysis, discuss the results, and come to conclusions about their economic significance and how to improve my analysis.

2. Review of past literature

The topics of domestic and cross-border mergers and acquisitions have been researched thoroughly, particularly those involving US-based companies. The effect of

macroeconomic metrics and monetary policy on M&A activity in the Japanese market, however, has not. Even sparser is research done on the effects of the recent “Abenomics” policies on deal flow among Japanese companies. Below I highlight some of the major relevant works of literature pertaining to my topic of interest.

Beckett evaluated the effect of the business cycle on corporate mergers in the North American market. He particularly focused on macroeconomic variables that were determinants of M&A activity, which he noted historically, occur in waves, based on various metrics of economic strength. To estimate the influence of macroeconomic variables on merger activity, he selected the S&P 500 level, yield on the 10-month Treasury bill, domestic nonfinancial debt, measure of the stock of money, capacity utilization rate and gross national product (GNP) as his explanatory variables for a multivariable regression against the number of mergers and total value of mergers in the US market. In explaining the number of mergers between the first quarter of 1961 and third quarter of 1985, of the six variables, the yield on the 10-month Treasury bill, level of domestic nonfinancial debt and capacity utilization rate were statistically significant in the short-run at the 10% level, and only the T-bill rate and capacity utilization rate were significant in the long-run. In explaining the value of total mergers between the fourth quarter of 1961 and the third quarter of 1985, his regressions estimated that in the short-run, the capital utilization rate and GNP levels were statistically significant, and the S&P 500 level, domestic nonfinancial debt level and GNP level were significant in the long-run, all at the 10% level. He also explored the other direction, running regressions for the effect of the number of mergers and value of mergers during those periods on macroeconomic factors as the dependent variables. All variables yielded statistically

insignificant coefficients. He found that about one-third of the variation in M&A activity during the period can be attributed to changes in the six macroeconomic conditions that were tested. Most relevant to my topic of interest, he concluded that changes in real interest rates were most influential to M&A activity in the US markets (Becketti 13-26).

A more recent and complex study is Choi and Jeon's exploration of the impact of the macroeconomic environment on M&A activity using time-series data from the US market. They found that there is a long-run equilibrium relationship between their chosen macroeconomic variables and four different variables that measure merger activity, which implies that macroeconomic in fact play an influential role in determining M&A deal flow. However, the factors they found as the most influential on M&A activity differ from those previously identified by Becketti. The macroeconomic dependent variables that they selected overlapped but were not identical to Becketti's paper. They were; the 10-year Treasury bond rate, the S&P 500 close, real GDP, the effective Federal Funds Rate (FFR) and corporate net cash flow. The four independent parameters that represented measures of M&A activity were M&A frequency, total value, total value/total assets, and total value/S&P 500 volume. They found that in the short-run, strong stock market performance was highly correlated with merger activity, especially in terms of frequency. GDP and more corporate liquidity were also positively correlated with the four parameters for merger activity. The FFR, which is a representation of monetary policy, seemed to have an indeterminate effect on M&A activity in the US. Positive signs on the coefficients for the FFR and 10-year Treasury bond rate were inconsistent with past literature. However, after lag variables were incorporated into the analysis, they observed the expected negative coefficients on the FFR and 10-year

Treasury bond rate, especially around the 3 and 4 year lags. As a result of such factors, they concluded that the most important macroeconomic variables in determining M&A activity in the US market between 1980 and 2004 were real GDP for the frequency based measure of merger activity, and the performance of the stock market and monetary policy for the total value measure of M&A activity (233-249).

In regards to the Japanese market, there is little existing literature on the effects of macroeconomic conditions and monetary policy specifically on M&A activity, but relevant literature does exist. Ueda offers a historical review of the BOJ's monetary policies in the last couple of decades, especially between 1992 and 2006. Since the early 1990's Japan has experienced serious economic troubles due to declining asset prices, a dysfunctional financial system and an all-round stagnant economy. Ueda analyzes the ineffectiveness of near-zero interest rates throughout the 1990's, the zero interest rate policy (ZIRP) in 1999 and the transition into quantitative easing in March 2001, which inflated the BOJ's balance sheet to unprecedented levels by 2006. Ultimately, he concludes that the systematic purchasing of government securities, mostly Japanese Government Bonds (JGBs) were successful in decreasing short-term interest and money market rates, and long-term rates to a lesser degree. The asset markets also responded favorably for a while, but declined to initial levels over time due to a market-wide disappointment in lack of economic activity (175-190).

Leigh, Chevapatrakul et al. and Ahearte et al. all conclude that Japanese interest rates fit a forward-looking Taylor rule. The Taylor rule states that central banks should raise short-term interest rates to levels above inflation, which increases interest

rates when pressures on inflation come into play. Leigh investigated how the BOJ conducted monetary policy when the economy started to spiral downwards in the 1990's. Using a Bayesian approach, he investigated the interest rate reaction function of the central bank in conjunction with a structural model of the economy. He found that though the BOJ received much criticism for their "far-fetched," ultra-low interest rate and inflation policies in the 1990's, there was actually nothing unorthodox about the central bank's approach. The interest-rate policy fit a Taylor rule reaction function in which the inflation target declined over time, much like the other global central banks in developed nations. Next, using the structural economic model, he found that Japan's poor economic performance during the period was not solely a result of monetary policy. He was able to identify multiple adverse shocks to the economy throughout the 1990's that at least were partially responsible for the so-called "Lost Decade" (833-857).

Shifting focus to a decade earlier, Miyao finds that monetary policy shocks have a persistent influence on real output in the Japanese economy, particularly in the "bubble economy" of the 1980's. Using the call rate as a representation for monetary policy, the monetary base as an indicator for money demand among private banks, the stock price to evaluate the effect of asset prices on the economic boom and industrial production as a measure of real economic activity, Miyao found that the easing and tightening of the money supply had the most influence on real output in Japan between 1981 and 1986. Stock prices and the monetary base also significantly influenced output (376-392).

On the financial side, there is thorough existing literature on the effects of the corporate environment and trends on M&A total deal value and frequency. Arikawa and

Miyajima used industry-level data to show that M&A activity in Japan is most heavily influenced by economic shock. Instead of using macroeconomic variables that proxy for monetary policy like money market rates or interest rates, however, they used fundamental corporate environment metrics. Their variables included Tobin's q , expected return on stock, the volatility of stock returns, return on assets, cash flow/sales ratio, growth rate of employees, sales growth, deviation of sales growth from its previous 5-year average, and the yearly change in base money of the money supply. They found that the deviation of sales growth from the trailing average was the most influential in determining M&A activity in the Japanese market, which was the proxy measure for economic shock (Arikawa).

Jackson and Miyajima used comparative analysis to explore the differences in M&A growth between France, Germany, the US, the UK and Japan between 1991 and 2006. They found that all five countries experienced varying degrees of growth in M&A activity, both in frequency and total deal value. The expansion of M&A in Japan can be attributed to the emergence of new technologies, growth in information and communication technology, and the consolidation of existing industries. Financial health of the economy also played a role in the growth trend, as the stock market boom and growing use of stock swaps helped facilitate M&A expansion. Finally, legal changes in financial law were also a factor. Deregulation allowed firms to adopt holding company structures for the first time in decades. This led to the creation of many "mega-banks" as the financial industry consolidated their activities to combat bad debt. There were also a handful of new laws that made M&A more flexible, including the permitting of stock swaps and spin-offs (Jackson).

3. Review of “Abenomics”

Since part of the motivation behind this paper is to evaluate the effects of the current unprecedented period of ultra-low interest rates, and how it has affected M&A deal flow in Japan compared to the last twenty years or so, I thought it worthy to review the basic details behind the financial buzzword, “Abenomics.” The term is a combination of the family name of the recently re-elected Prime Minister of Japan, Shinzo Abe, and “economics.” It refers to the political and economic policies enacted by Abe and his cabinet since his reintroduction to the top seat in December 2012, with a promise to end deflation and bring Japan out of the “lost decades” of the last 20 years. Japan has experienced extended periods of deflation and negative economic growth since the asset “bubble” of the flourishing 1980’s popped and drove Japan into a severe recession. China surpassing Japan as the world’s second largest economy in 2010 was a wake-up call for many Japanese leaders, and the earthquake tragedy in northeastern Japan of March 2011 stirred up a consolidated sense of Japanese pride and unity across the nation. It was the perfect platform for Prime Minister Abe and his Liberal Democratic Party to launch his campaign for his second tenure in office. The Japanese people received his powerful rhetoric on a stronger, more independent Japanese nation with a revived economy with overwhelming enthusiasm (“Abe’s Master Plan”).

“Abenomics” is characterized by Abe’s “three arrows,” which are bold monetary policy, flexible fiscal policy, and structural reform. What really differentiates “Abenomics” from past attempts at rebooting the weak economy is the final arrow, which aims to fundamentally change the way Japan facilitates business at home and with the

rest of the world. All of the “three arrows,” however, are considered crucial by Prime Minister Shinzo Abe and the BOJ for the resurgence of the Japanese economy. His “three arrows” were the primary item on his ticket, and he hit the ground running with the institution of the first two arrows as soon as he was instated in December 2012 (Patrick 2).

The first arrow, as mentioned above, is bold monetary policy, which set up a quantitative easing program unprecedented by any nation. One of PM Abe’s first actions was to instate Haruhiko Kuroda, who shares the same philosophy as Abe on the importance of reversing deflation to revive the broken economy, as Governor of the BOJ. In January 2013, the government and the BOJ issued a joint statement promising a “price stability target” of 2% inflation. Compared to the low or negative inflation that the country had been experiencing for over 20 years, this was a relatively ambitious promise, and extensive measures were to be taken to ensure success. The target was to be met with extremely large-scale systematic asset purchasing, and in April 2013 the BOJ introduced Quantitative and Qualitative Monetary Easing, or QQME. The press nicknamed the program “Q-squared,” to highlight how drastic the measures were compared to prior periods of quantitative easing. The BOJ released a detailed statement on April 4, 2013, stating that the monetary base will grow annually at a rate of 60 to 70 trillion yen. Additionally, the BOJ would purchase 50 trillion yen in JGBs, 1 billion yen in Exchange Traded Funds (ETFs) and 30 billion in Japanese Real Estate Investment Trusts (J-REITs) annually to add credit risk to the portfolio. The prior program, named the Asset Purchase Program and only half the size of the new QQME program, was officially terminated. (“Introduction of the ‘Quantitative and Qualitative Monetary Easing’”). Market prices

were considered the most important factor in ending deflation, and Kuroda was quoted in saying that “if anything were to arise that poses a risk to meeting the price stability target, I will without hesitation make the necessary alterations to our policy” (“Abenomics is Progressing!”).

The second arrow was also initiated extremely early on in Abe’s reign, with an enormous stimulus package drafted within days of his instatement. In January of 2013, the government released its stimulus package of unprecedented size, with an estimated 10.3 trillion yen in spending from the central government and over 20 trillion yen in total package size, including spending from local governments (Ujikane). An additional 5.5 trillion yen plan was laid out in December 2013 to counteract the consumer tax increase (5% to 8%) planned for April 2014 (Mochizuki). Of the original stimulus plan, 3.8 trillion yen was allotted to disaster relief in the wake and continued suffering from the 2011 earthquake and tsunami disaster, 3.1 trillion yen to the “creation of wealth through growth,” which includes stimulating private investment, the expansion of Japanese business in foreign nations, measures for human capital development and employment, and measures for small-mid size enterprises, small-scale businesses and agriculture, forestry and fishing, and another 3.1 trillion yen to “ensuring a sense of security in daily life and revitalizing the regions,” which includes supporting local government funding and national subsidies for multiyear construction projects. The government also plans to halve the primary deficit by 2015, and will roll out the latter stimulus plan without further purchases of JGBs (“Emergency Economic Measures for the Revitalization of the Japanese Economy”).

So far, at least in the short-term, the quantitative easing and fiscal stimulus mechanisms seem to be successful in reversing deflation and improving the economy. As of January 2014, the Consumer Price Index (CPI) for Japan was at 100.7, 1.4% higher than the previous year. The yen had weakened 6% against the US dollar as of March 20th, 2014, which has proved beneficial for the many major export-dependent corporations in Japan. A weaker yen makes Japanese exports relatively competitive to exports from other nations, and the Japanese government was even accused of initiating a “currency-war” among Asian nations by tempting their neighbors to also depreciate their currency in order to drive business. Abe and Kuroda both staunchly rejected such claims, stating that their only motivation behind the large-scale quantitative easing program was ending deflation and reviving the economy, and currency depreciation was simply a natural side effect of the rapid expansion of the BOJ's balance sheet (“Abe’s Master Plan”). The asset markets have also responded favorably, with a 57% increase in the Nikkei 225 Index in 2013, compared to a 31% increase in the S&P 500 index, which was also considered to have a very strong year. The total return for the Nikkei 225 index and S&P 500 index between December 2012 and December 2013 are shown in *Figure 1*.

These signs of improvement, however, could just be temporary and ultimately artificial. Hugh Patrick from the Center on Japanese Economy and Business at Columbia University agrees that the early signs have been positive, but that “it is far too early to tell whether Abenomics will be successful—in ending deflation, bringing about price stability and getting the economy onto a stable, full employment growth path. The initial evidence is certainly positive, but there is a long way to go” (9). He goes on to state that “[f]iscal and monetary policy alone cannot provide good, stable, long-run growth, but

they do provide the underlying policy environment. Market liberalization and structural reforms are needed in Japan to create new opportunities for companies to invest—both in services and in agriculture” (10). That brings us to the third arrow.

The third arrow is the most vague, the most difficult to quantify, and overwhelmingly the most challenging arrow of the three. It is outlined into four parts by Abe and his cabinet: promotion of investment, strengthening utilization of human resources, the creation of new markets, and global economic integration. The first section, the promotion of investment, focuses on bold tax incentives for corporate capital investments, and the target is to increase the capital investment rate to pre-global financial crisis levels in 3 years (2012 capital investment was 63 trillion yen, and the new official target is 70 trillion yen). The main focus of the second part, strengthening utilization of human resources, is increasing the participation of women, the elderly and the young in the work force. Female participation between the ages of 25 and 44 is targeted to reach 73% from 68% by 2020, long-term unemployment is targeting a 20% decrease over the next 5 years, and doubling the number of international students from 60,000 to 120,000 is another target. The participation of women is particularly important, as the work force is continually shrinking because of Japan’s upside down age structure. The aging and shrinking population is putting considerable stress on government welfare and the economy as a whole. However, increasing the participation of women by 5% may prove to be extremely challenging, as it extends to more than just economic forces, and attempts to shake the foundations of a still very male-dominated Japanese society. The main focuses of the third factor, the creation of new markets, includes streamlining the approval process for leading medical technology and establishing an institution to

manage cutting-edge technology and development. Key targets for success include expanding the market for healthcare and other life-related industries from 4 trillion yen currently to 10 trillion yen in 2020, increasing the medical market to 16 trillion yen from 12 trillion yen by 2020, and tripling the size of PPP/PFI (Public Private Partnerships/Private Finance Initiatives) projects to 12 trillion yen over the next 10 years. The final part to the four-part “third arrow” is to promote global economic participation, which the government plans to do so by promoting global expansion of Japanese enterprise and direct foreign investment in Japan. They have already proposed entrance into the Trans-Pacific Partnership (TPP), and further participation in the Japan-European Union Economic Partnership Agreement talks is expected. Some nominal targets include increasing trade under Free Trade Agreements to 70% by 2018 from the current level of 19%, doubling the amount of direct foreign investment to 35 trillion yen by 2020 and attracting 10 million international tourists in the year 2013 (actual figure was 10.7 million) and 30 million in 2030 (“Abenomics is Progressing!”) The long-term success of Abe and Kuroda’s economic policies will ultimately depend on the influence of the third arrow.

4. Overview of analysis and data

Analysis

For my evaluation of the macroeconomic determinants of M&A deal flow and total deal value in Japan, I follow closely Beckett’s procedure with M&A activity in the US in 1986. I follow his lead in exploring total deal value and number of deals for my dependent variables, as I run separate regressions evaluating possible differences between

the two metrics. My explanatory variables are similar but slightly different. As mentioned above in the literature review section, Beckett examined the effects of the S&P 500 level, yield on the 10-month Treasury bill, domestic nonfinancial debt, measure of the stock of money, capacity utilization rate and GNP level on our two M&A activity metrics. S&P 500 level is replaced with the Nikkei 225; the 10-month Treasury bill rate is replaced with the yield on the 10-year JGB; I use the 1-month uncollateralized call rate in yen to represent the money supply, and the level of total national debt in yen to replace domestic nonfinancial debt (purely based on data availability). Capacity utilization rate remains the same. To attempt to extend upon Beckett's analysis, I add the historical price/earnings ratio on the Nikkei 225 Index, the returns in percent of the Nikkei 225 index, and the spot rate in yen for JPY/USD. The Nikkei 225 P/E is included to test whether or not how relatively "expensive" or "cheap" the equity market is has an effect on M&A activity. The spot rate is included to capture the influence of the currency rate on cross-border deal flow. Finally, I add a dummy variable for whether the month was before or after the global recession of 2008. I assigned a "1" to the months before the financial crisis, and a 0 to the months since then. The final month of my "pre-crisis" data is September 2008, which is the month that Lehman Brothers went down. Finally, I attempted to collect Japan's GDP data, but only data dating back to 1994 was available from my resources, so I unfortunately decided to proceed without it.

Apart from the minor differences in explanatory variables, there are two major differences between my analysis and Beckett's regressions on M&A activity in the United States. The first is that I am using monthly data rather than quarterly data. With a shorter time frame than Beckett's data set, I thought it important to increase the number

of data points by using monthly data. Also, since I want to look at the effects of the recent period of ultra-low interest rates and fiscal stimulus on M&A activity in Japan, quarterly data would not have made much sense, considering the policies have only been in place since December of 2012. The second major difference is the use of lag variables, which is an idea borrowed from Choi and Jeon's paper from 2010. I lag the Nikkei 225 level, the 10-year JGB rate, the 1-month uncollateralized call rate, the Nikkei 225 returns, and the JPY/USD spot rate by 1, 2 and 3 years, which is 12, 24, and 36 data points, to come up with a total of 15 extra explanatory variables. The lag variables should capture the effect of, for example, the 10-year JGB rate in January of 2000 on the M&A activity in January 2001, 2002 and 2003. The lag variables are included with the logic that the explanatory variables may not have an effect on M&A activity in Japan immediately, and might take 1-3 years to have an effect due to the lengthy process of designing, proposing and executing an M&A transaction.

My model is a straight forward multiple regression, incorporating lag variables for the call rate, stock market level, interest rate yield, spot rate and stock market returns.

The basic model is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon$$

Where:

Y_{sum} : Total deal value	β_{call1} : 1 year lag of β_{call}
Y_{count} : Total number of deals	β_{call2} : 2 year lag of β_{call}
B_{jgb} : 10-year JGB yield	β_{call3} : 3 year lag of β_{call}
β_{call} : 1-month uncollateralized call rate	β_{nky1} : 1 year lag of β_{nky}
β_{nky} : Nikkei 225 Close	β_{nky2} : 2 year lag of β_{nky}
β_{caput} : Capacity utilization operating ratio	β_{nky3} : 3 year lag of β_{nky}
β_{nkype} : Nikkei 225 Price/Earnings ratio	β_{spot1} : 1 year lag of β_{spot}
β_{debt} : Level of total national debt	β_{spot2} : 2 year lag of β_{spot}
β_{spot} : JPY/USD spot rate	β_{spot3} : 3 year lag of β_{spot}
β_{nreturns} : Nikkei 225 returns	$\beta_{\text{nreturns1}}$: 1 year lag of β_{nreturns}
B_{jgb1} : 1 year lag of β_{jgb}	$\beta_{\text{nreturns2}}$: 2 year lag of β_{nreturns}
B_{jgb2} : 2 year lag of β_{jgb}	$\beta_{\text{nreturns3}}$: 3 year lag of β_{nreturns}
B_{jgb3} : 3 year lag of β_{jgb}	β_{crisis} : Dummy for financial crisis (1 or 0)

I run six regressions in three different ways. I first run regressions for total deal value and total number of deals without lag variables. I then run the same regressions with the lag variables. Finally, I run the regressions without lag variables using only data from January 2012 to December 2013 to capture the most recent periods of quantitative easing, though “Abenomics” only officially started in January of 2013. I keep in mind that there may be inaccuracies in my results due to such few observations.

Data

Data on M&A transactions in Japan were pulled from a Bloomberg® terminal. I found a list of deals with their completion dates and completed deal value ranging back to 1989. I included only M&A deals, leaving out venture capital, private equity, partial ownership, etc. Both stock and cash deals were included, and I put no upper- or lower-bound limit on deal sizes. Finally, deals were included in the list only if they were completed, as deals that were proposed and terminated were left out of the bunch. I then aggregated the data to find the total number of deals and total deal value per month, from September 1989 to December 2013. The data for the first couple of years was incomplete, as for many of the months early on in my data set, there are no recorded completed deals. Keeping in mind that the asset bubble of the 1980's had not yet imploded in 1989 this seemed odd. As a result, I decided to limit my analysis to the months ranging from June 1997 to December 2013. This inhibits my ability to compare the more recent periods of quantitative easing to the early 1990s, but the alternative would be to work with a blaringly incomplete data set, which is the lesser of my options.

The yield on the 10-year JGB, Nikkei 225 prices, the capacity utilization rate, the JPY/USD spot rate, and the Nikkei 225 historical P/E are also from Bloomberg® resources. I used the Japanese Government Bond 10-year yield Month Over Month Index and pulled the data from the historical price chart. Nikkei 225 data uses month-end prices from historical price tables of “NKY Index.” The P/E data uses month-end values for the “NKY Index Historical P/E Index.” Nikkei 225 returns were calculated in excel based on the month-end closes. The capacity utilization rate was taken from the Japan Capacity

Utilization Operating Ratio Index (JNCAPMOM) with a 2010 as the base year. The JPY/USD spot rate data is the month end spot rate for the exchange rate between Japanese yen and US dollar. Data for the 1-month uncollateralized call rate and total national debt levels are taken from the BOJ's online statistics database. Both use month-end values.

5. Summary statistics and regression results

Summary statistics

Table 1 displays the summary statistics for all the variables. The top two line items, "Sum" and "Count," are the dependent variables, and the rest are independent variables. There are a total of 199 observations from June 1997 to December 2013.

The month with the largest total deal value was February 2005, though that month only had 35 total deals. This was due to the high-profile and big-money acquisitions of Mitsubishi UFJ Financial Group, Inc. and Mitsubishi UFJ Securities Holdings Co Ltd by UFJ Holdings, Inc. and UFJ Tsubasa Securities Co Ltd, respectively. These were a couple of the many major bank mergers that occurred during this time period. The minimum number of transactions that occurred in a month was 1, which only occurred in the first year of my data. This is perhaps a coincidence or the remnants of incomplete data that I tried to eliminate earlier on. The average number of deals per month was about 25, which implies a rate of 300 deals per year, which seems to be a healthy number for an economy that has been considered stagnant for the past 20 years or so. The average Nikkei 225 returns, however, was 0.00, which paints a picture of the economic troubles Japanese markets have experienced in the past couple of decades. The national debt has

ballooned 2.8 times since 1997 (though the minimums and maximums aren't exactly the June 1997 and December 2013 levels, they are close). The difference in the minimum and maximum spot rates is astounding for an economy of such global importance, with the maximum almost double the 76.27 YEN/USD rate we saw in January of 2012. The JGB 10-year yield, which is the variable of utmost interest to my analysis, has not changed significantly since 1997. Though the early 1990's experienced rates above 8%, our range since June 1997 is only 0.54% to 2.59%.

Figure 2 and *Figure 3* represent the trends in total deal value and total number of deals *per year* between 1998 and 2013 (1997 is left out since the data begins in June). There seems to be little to no trend in the fluctuation of total deal M&A deal value from year to year, but the total number of deals shows a clear trend. There is an upward trend between 1998 and 2001, then a plateau (or slight decline) until 2003, another upward trend until the global financial crisis in 2007, then a general decline until 2013, though 2011 seemed to be a relatively active year. These trends encouraged the inclusion of a dummy variable for the global financial crisis to attempt to capture its effect on total M&A deal values and deal flow in Japan.

Regression 1: No lags

Table 2 displays the results from this regression. According to my model, the variables that are significant in determining the total deal value and total number of deals in a given month are somewhat different. The statistically significant variables in determining the total deal value in a given month between June 1997 and December 2013 are the national debt level, the JPY/USD spot rate, and whether or not the month was

before or after September 2008. Debt level has a positive relationship with total M&A deal value, and the spot rate has a negative relationship with the dependent variable. The positive sign on the *crisis* coefficient suggests more deals were completed monthly before the crisis than afterwards.

The statistically significant variables in determining the number of deals completed in a given month in our period are the 10-year Japanese Government Bond yield, the 1-month uncollateralized call rate, the Nikkei 225 level, the national debt level, and whether or not it was before or after the global financial meltdown. The JGB yield, the call rate, the national debt level and financial crisis dummy all have a positive relationship with total number of deals, and the Nikkei 225 level has a negative relationship with it. The intercept is also statistically significant.

According to my results, my selected independent variables explain 12.4% and 57.0% of the variation in total deal value and total number of deals, respectively, for M&A transactions in Japan between June 1997 and December 2013 per month.

Regression 2: With lags

Table 3 displays the results from this regression. Adding lags changes the significance of many variables that were previously significant. The only variable that is significant in determining the total deal value of M&A transactions is the two-year lag on the JGB 10-year yield. The previously significant debt level, spot rate and financial crisis dummy variable all became statistically insignificant.

In determining the total number of M&A deals, the 1-month uncollateralized call rate, national debt level and the financial crisis dummy variable all remain significant. All signs are positive, in line with the original regression. Previously significant JGB 10-year yield, Nikkei 225 level and the intercept all become insignificant in this regression.

According to my results from this regression, my selected independent variables explain 22.4% and 41.5% of the variation in total deal value and total number of deals, respectively, for M&A transactions in Japan between June 1997 and December 2013 per month. Though the decrease in R^2 for the regression for total number of deals from the original regression seems odd because we are increasing the number of explanatory variables, it is mathematically viable because of the reduction in the number of observations.

Regression 3: January 2012-December 2013, no lags or dummy variable

Table 4 displays the results from this regression. My final regression results should be inconclusive due to the small number of observations, but despite the sparse data, some of the variables did end up significant. The capacity utilization rate is significant at the 5% level and has a positive relationship with the monthly total deal value of M&A transactions in 2012 and 2013. For the regression exploring the determinants of the total number of M&A deals, the Nikkei 225 close, level of national debt and Nikkei 225 returns come out statistically significant. They all have a negative relationship with the regressor.

For the final regressions, my selected independent variables explain 40.0% and 63.6% of the variation in total deal value and total number of deals, respectively, for M&A transactions in Japan between June 1997 and December 2013 per month.

6. Discussion of results

Regression 1: No lags

Just by taking a look at **Figure 3** and **Figure 4** above, it is evident why the regression results seem to be more conclusive for the *count* regressor than the *sum* regressor across all of my analyses. The trend for M&A deal flow, on an annual basis, is relatively smooth. As aforementioned, it rises until 2007 and starts to dip afterwards. The trend, if there even is one, for total deal value is less clear. There is no obvious upwards or downwards trend and no obvious turning point. The only thing consistent with the *count* histogram is that both categories seem to peak around the 2006/2007 era. However, as seen in our summary statistics and as is evident in the visual representations, many deals in a certain period do not necessarily equate to large total deal value, and vice versa. A great example is 2010, when there were a healthy 345 deals that amounted to only 6.6 trillion yen in total deal value, which is just short of 3 trillion yen below the annual average for this time period. 2005, as mentioned above, is a good example of the opposite. 355 deals, just 10 more than in 2010, amounted to almost 14.7 trillion yen in total deal value. The reasons for these variations may be attributed to different types of deals occurring in different corporate environments across time periods. For example, there are some years with many smaller mergers, and some years with fewer larger mergers. Explaining this phenomenon, however, is beyond the scope of this paper, and

would require further investigation beyond just macroeconomic determinants of M&A activity.

Another metric to suggest that total number of deals is better explained by our macroeconomic variables than total deal value is the respective R^2 values, particularly in the first regression. Only 12.4% of the variation in total deal value is explained by our explanatory variables, but a surprisingly large 57.0% of the variation in the number of deals per month is explained by our macroeconomic factors. The two factors that are significant for both regressors are the national debt level, and the financial crisis dummy variable, and are both significant in the same direction. The positive sign for the financial crisis binary variable makes sense. Since the data before September 2008 were assigned a “1” and the more recent months were assigned a “0,” the positive sign suggests that there were more M&A deals and larger total value of deals before the crisis than afterwards. This is especially significant because of our relatively short time frame, as our data only starts in 1997.

The significance of the national debt level for both regressions is also in line with expectations. As the BOJ borrows more and more money, interest rates should stay low, further stimulating investments such as M&A transactions. What’s interesting, however, is that for the *count* regression, the 10-year JGB yield is statistically significant in the *positive* direction. One would expect the opposite: lower interest rates should theoretically stimulate risky investments, and therefore the sign on the JGB yield should be negative. Choi and Jeon also encountered this puzzle in their 2010 paper on the effects of the macroeconomic environment on US M&A activity. My theory for why our data

suggests the opposite is that since interest rates have been so low in Japan throughout the entire period, they cease to be a determinant in entering into an M&A transaction. As stated in the summary statistics part of the results section, the JGB range throughout our time period is quite small, as there is only a 2.05% difference between the lowest yields and highest yields between 1997 and 2013. Moreover, the minimum is 54 basis points, and the maximum is about 260 basis points, which would both be considered ultra-low interest rates. Though 54 basis points is more favorable from a borrowing perspective, 260 basis points is far from too expensive to finance a deal in any state of the economy.

Additionally, as seen in *Figure 4*, the 54bp and 260bp yields are relative outliers, as the yields stayed between 100 and 200bp for most of the time period. Only with the introduction of “Abenomics” did it plummet again towards the end of the data. The same logic can be applied to the positive sign on *call* for the regression on the total number of M&A deals. Again, the range of the 1-month call rate is only between 0.00 and 1.50. The massive amounts of liquidity being pumped into the system over our 16-year period kept call rates low and relatively stable.

As evident in *Figure 5*, the national debt level grew steadily over our time period. This suggests that the various measures of quantitative easing between 1997 and 2013 happened at a relatively consistent level. With the unprecedented security purchasing of QQME and mass fiscal spending beginning in the last couple of years, you would expect future versions of the same graph to have a more aggressive upwards movement in 2014 and 2015, but the effects of Abe’s policies are not yet evident in our data. The steady growth in national debt is consistent with the narrow range of JGB 10-year yields. It

reflects the consistent low-interest rate policy of the BOJ through the late 1990's and the first decade of the 2000's.

The final significant variable in the *sum* regression is the JPY/USD spot rate, which is significant at the 5% level. Its negative sign suggests that strengthening of Japanese yen relative to the US dollar causes an increase in the total deal value, in yen, of M&A transactions in Japan. Compared to other variables in my regression, the JPY/USD spot rate presumably has a larger effect on cross-border deals than on domestic ones. Intuitively, the negative sign means that a stronger yen gives Japanese corporations the ability to invest in foreign entities at a lower price in yen, increasing the bargaining power of Japanese companies in purchasing abroad. It also suggests that Japanese companies spend more purchasing abroad when the yen is strong, than do foreign companies in Japan when the yen is relatively weak.

The final two statistically significant coefficients in the *count* regression results are the Nikkei 225 close and the intercept. The negative sign on the *nky* coefficient makes sense intuitively. As equity markets get more expensive, so do the values of companies, and especially with the relevantly static (albeit low) interest rates during the period, expensive equity markets could deter some potential corporate marriages from occurring. Finally, the negative intercept is significant at the 99% level. It suggests that if all other variables were zero, then we would "have" -33.65 mergers a month. However, this is nonsensical, since some of the variables, the Nikkei 225 level, capacity utilization, the spot rate, and the Nikkei 225 P/E ratio to be specific, can never be zero.

Regression 2: With lags

Adding lag variables changes the significance of the explanatory variables an alarming amount. For the *sum* regression, only one variable is significant, which is the 2-year lag on the JGB 10-year yield. This suggests that, hypothetically, interest rates from two years before have a significant effect on the total deal value of M&A transactions today. Since the original list of deals I started with is sorted chronologically by the date the deals were completed, it makes sense that current interest rates would not have an immediate effect on M&A activity. However, two years for a deal to be proposed and completed seems like a long time, considering average completion time for M&A deals in Japan is about 100 days (Thompson Reuters). The national debt level and spot rate and financial crisis binary variable from the previous regression all lose their significance.

For the *count* regression, the JGB yield, Nikkei 225 returns and intercept all lose their significance with the addition of lag variables. None of the lag variables turn out to be statistically significant. The call rate, national debt level and financial crisis dummy variable all retain their significance, but with much lower t-values. Only the national debt level retains its 99% significance. It is worthy to note that the level of national debt has been significant in 3 out of 4 of the first two rounds of regressions, and seems to be the most prominent of the explanatory variables included in my analysis.

The most important aspect of this second round of regressions to note is the change in R^2 values. In the first round of regressions, the R^2 values were 12.4% and 57.0% for *sum* and *count*, respectively, and the adjusted R^2 values were 8.2% and 55.0%, respectively. The second round of regressions yielded R^2 values of 22.4% and 41.5% and

adjusted R^2 values of 8.9% and 31.3% for *sum* and *count*, respectively. For the *sum* regressions, R^2 went up considerably when adding lag variables, but their explanatory power is dulled by the increase of only 0.7% in adjusted R^2 . For the *count* regressions, both R^2 and adjusted R^2 actually dropped by considerable amounts. At first this seems odd because of the increase in explanatory variables, but if you count the reduction in observations due to 3 years' worth of lag variables (36 months, or 36 observations to be exact) and the addition of 15 degrees of freedom for the 15 extra explanatory variables, the stark contrast in explanatory power between the first and second round of regressions is understandable. The conclusion is that adding lag variables to my initial model does not really help explain the variation in either the total deal value or total number of deals for M&A activity per month in the Japanese markets between July 1997 and December 2013.

Regression 3: January 2012-December 2013, no lags or dummy variable

The final round of regressions, with only data from January 2012 to December 2013 must be examined throughout with a hint of distrust because of the sheer absence of sufficient observations, but I will nonetheless attempt to interpret the results. For the *sum* regression, only the capacity utilization rate, making an appearance for the first time, came out statistically significant at the 5% level. Its positive relationship with total deal value per month makes intuitive sense. The higher the capacity utilization rate of Japanese companies, the "healthier" the Japanese economy, and the more aggressively those companies can approach M&A situations. In comparison to the first round of

regressions, the reduced time frame renders the national debt level and JPY/USD spot rate statistically insignificant.

The R^2 , however, is higher for this regression than any other *sum* regression in my analyses. According to this regression, 40.0% of the variation in total deal value of M&A deals per month in Japan between January 2012 and December 2013 can be explained by the selected macroeconomic variables, with the capacity utilization rate being the only statistically significant one. These results can also be interpreted as a short-term phenomenon rather than a long-term one given in the earlier rounds of regressions. Though our results suggest that interest rates and stock market activity, those which would be quickly effected by “Abenomics” policies, do not have a statistically significant impact on total deal value, the capacity utilization rate indeed does in the short term. This is in line with Becketti’s 1986 results, where the capacity utilization rate was statistically significant to total deal value in the short-run for US M&A activity.

For the *count* regression, the JGB and call rates lost their significance in comparison to the first regression. This is not surprising, as they did not vary very much within the 23 months that are under investigation. The Nikkei 225 level, which shot up significantly in 2012 and 2013, retains its statistical significance with the *count* regressor in the negative direction and Nikkei 225 returns also becomes significant.

As evident in **Figure 6**, the Nikkei 225 close shot up very consistently between 2012 and 2013, as it continued to rebound from the 2008 financial crisis. Also, throughout 2013, it increased even more aggressively as it responded positively to Prime Minister Abe and the BOJ’s loose monetary policies and positive-minded economic

rhetoric. Month-on-month returns were also positive for the most part, as can be seen in *Figure 7*, which is expected in a continuously rising equity market. The results suggest that expensive equity markets are not a favorable environment for M&A deal flow, as we found earlier in the first round of regressions.

Finally, the national debt level retains its statistical significance in this third round of regressions, but in the opposite direction as the previous results. Though puzzling at first, this phenomenon can be explained quite simply. As Abe and Kuroda continued to push on with QQME and unprecedented fiscal policy, the national debt continued to balloon over this two year period. However, the number of mergers and acquisitions dropped off during this period in Japan (due partly to increasingly expensive equity markets, perhaps?), which would explain the negative relationship between the two variables. This can be interpreted as a case of correlation but not causation. Yes, the national debt did increase during this period, and yes, the number of M&A deals decreased during this period, but one did not necessarily cause the other. This is also in line with Becketti's findings in his exploration of M&A activity in the US market. The national debt was significant in the long-run but not the short-run in his analysis. If you write-off the negative relationship between national debt and M&A deal flow in the short-term as correlation but not causation in my analysis, then my overall results are consistent with his findings.

7. Conclusion and suggestions for further study

This paper explored the relationship between M&A activity, both in total deal value and total number of deals, in the Japanese market between 1997 and 2013 on a

monthly basis. During this time period, total deal value per month has fluctuated in a seemingly trendless fashion. The total number of deals, however, followed an upward trend until the financial crisis, after which M&A deal flow has declined in Japan. The attempt to see the effects of “Abenomics” on M&A activity was inconclusive, as there is not yet enough data to run an effective analysis.

Just over half of the variation in the total number of deals per month can be explained by our macroeconomic variables. Of the macroeconomic factors tested, the level of national debt seems to have the most effect on M&A activity. The variable of utmost interest, the JGB 10-year yield, had the opposite effect from what was originally expected. It does not make sense for interest rates to be positively related to the number of M&A deals closed, so this may be another case of correlation but not causation. Perhaps this is the difficulty of attempting to analyze such highly manipulated and artificially low interest rates. The effect that capacity utilization has on M&A activity in the short-run was a welcoming result, as it is consistent with Becketti’s findings in the US market.

In order to further understand the macroeconomic determinants of M&A activity, both by total deal value and total number of deals, this analysis should simply be performed with more years, and perhaps more reliable data. My original attempt to include the 1980’s and 1990’s in my analysis was cut short by a lack of reliable data, and if this data had been available, my results may be more conclusive. To find the effects of Prime Minister Shinzo Abe and the BOJ’s fiscal and monetary policies on M&A activity in Japan, this analysis should be performed at a later date. Attempting to connect the dots

in this case was premature. Finally, more of the variation in total deal value and number of deals can be explained with the incorporation of corporate-level data to account for the corporate environment.

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Appendix**Figure 1. Total return for Nikkei 225 and S&P 500 Index, December 2012-****December 2013**

A graphical comparison of the relative performance of the Nikkei 225 Index and S&P 500 Index between December 2012 and December 2013. The white line represents the Nikkei 225 Index and the orange line the S&P 500 Index. Their total returns for the period were 57% and 31%, respectively.



(Bloomberg data)

Figure 2. Annual total deal values from M&A activity in Japan, 1998-2013

The annual total deal values from completed M&A deals in Japan between 1998 and 2013. The blue bars represent millions of yen. There seems to be no distinct pattern in total deal value from year to year.

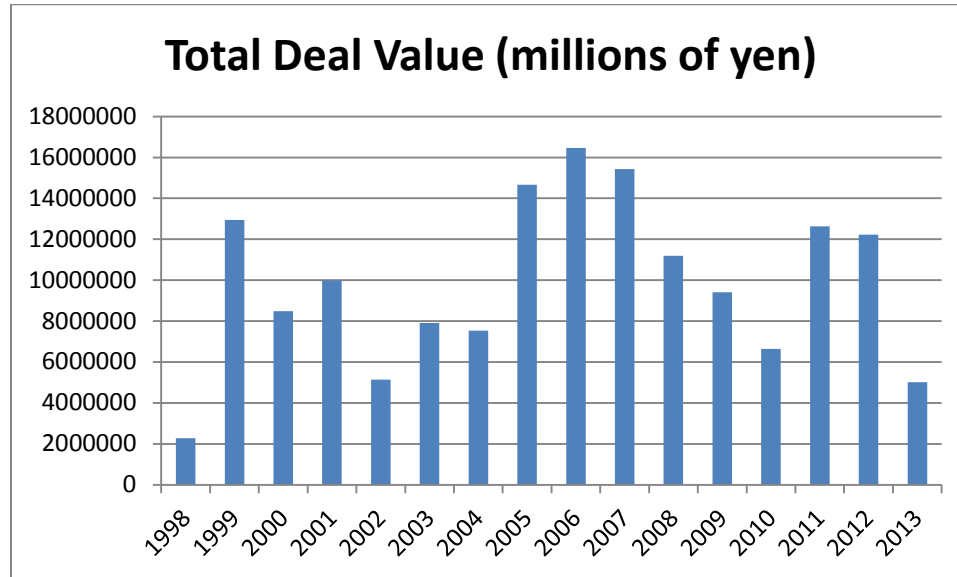


Figure 3. Annual total number of deals from M&A activity in Japan, 1998-2013

The total annual number of completed M&A deals in Japan between 1998 and 2013. The number of deals per year rises until around the time of the global financial crisis, then generally declines thereafter.

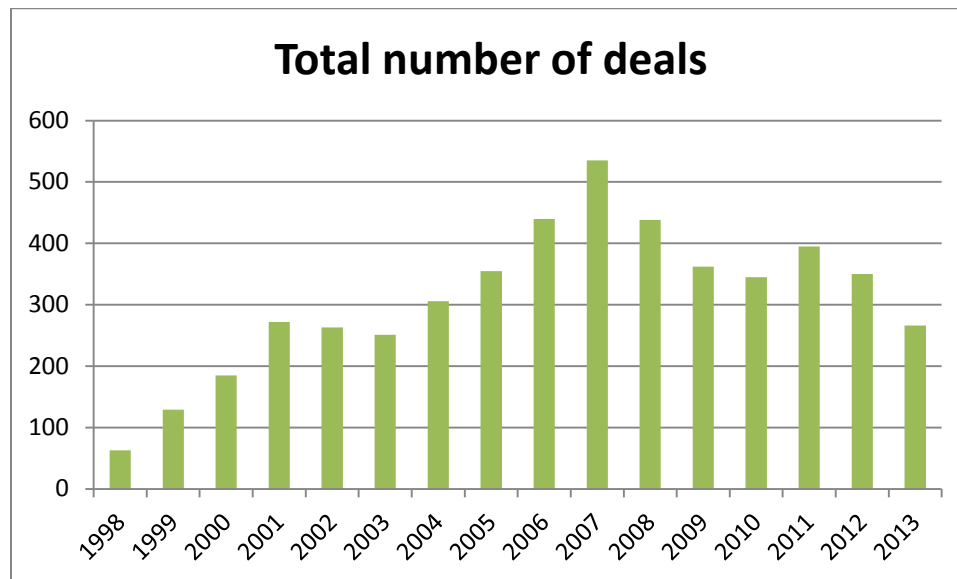


Figure 4. 10-year Japanese Government Bond yields, June 1997-December 2013

Month-end yields for the 10-year JGB in percent from June 1997 to December 2013. The range of yields stays relatively tight.

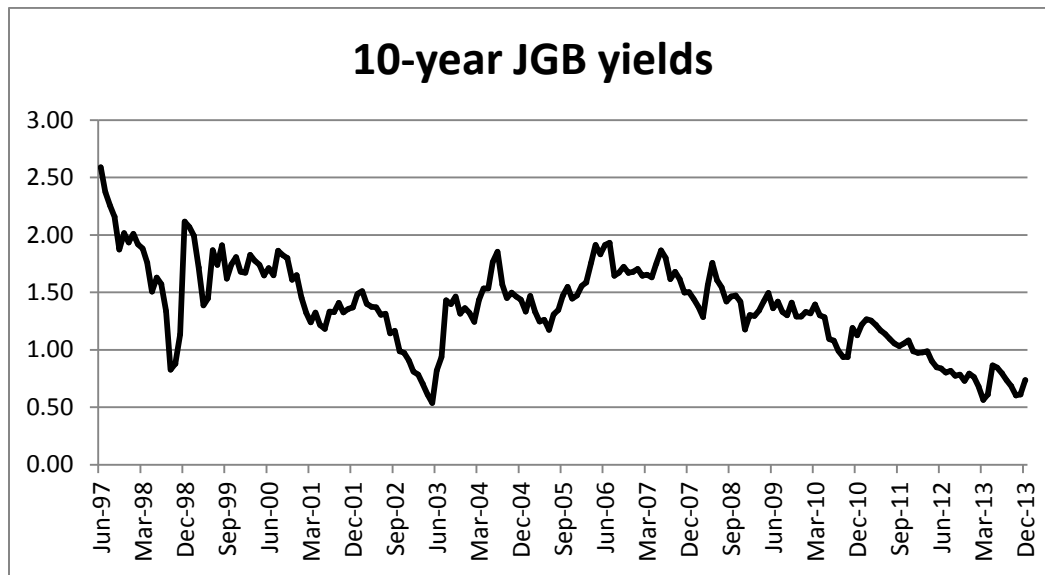


Figure 5. Japanese national government debt level, June 1997-December 2013

The level of the national government debt in 100 millions of yen. The steady increase in debt reflects the systematic asset purchasing executed by the BOJ.

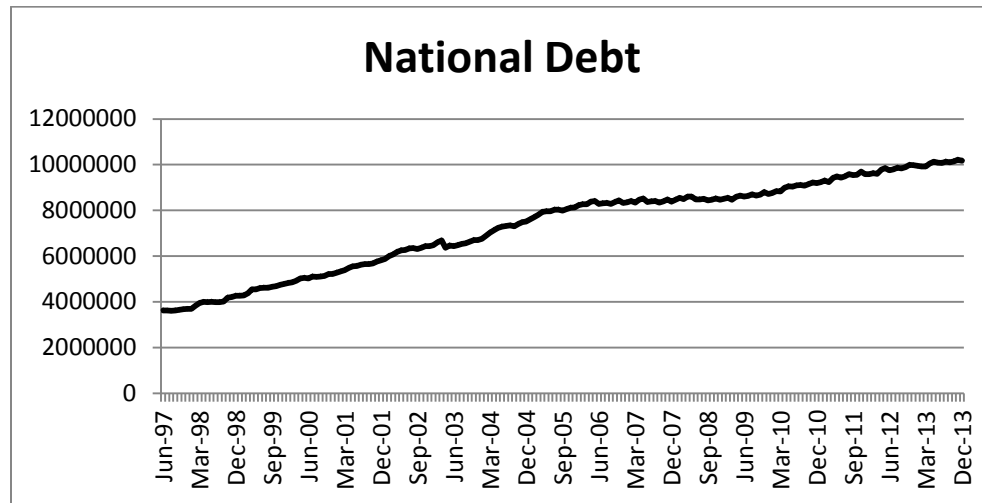


Figure 6. Nikkei 225 close, January 2012-December 2012

The month-end close prices of the Nikkei 225 index between January 2012 and December 2013. The stock market in Japan experienced strong performance during the period.

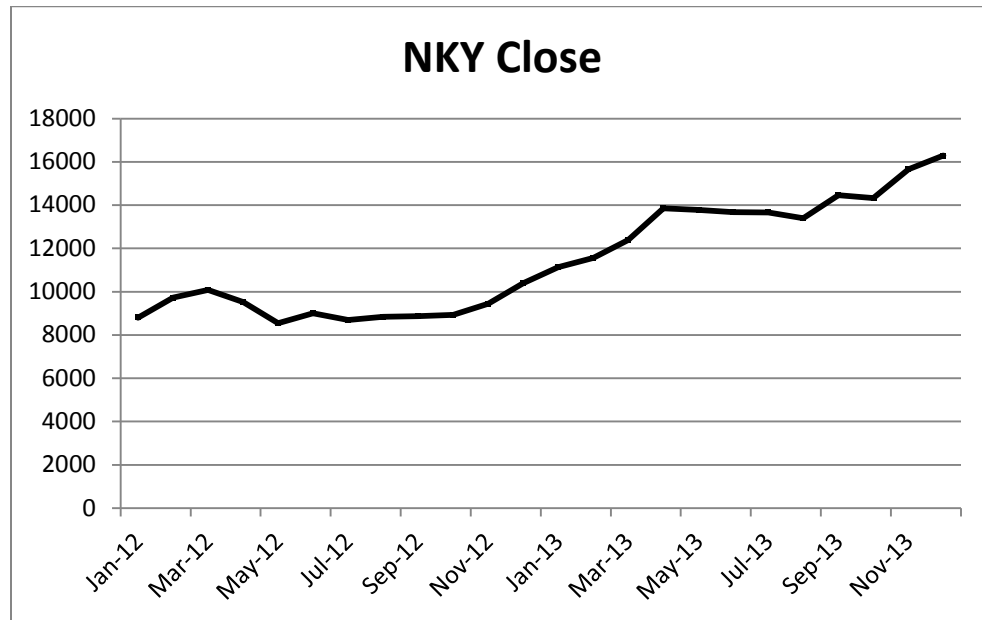


Figure 7. Nikkei 225 returns, January 2012- December 2013

Percentage returns of the Nikkei 225 index between January 2012 and December 2013. Returns were generally positive, reflecting the rising stock market levels in **Figure 6**.

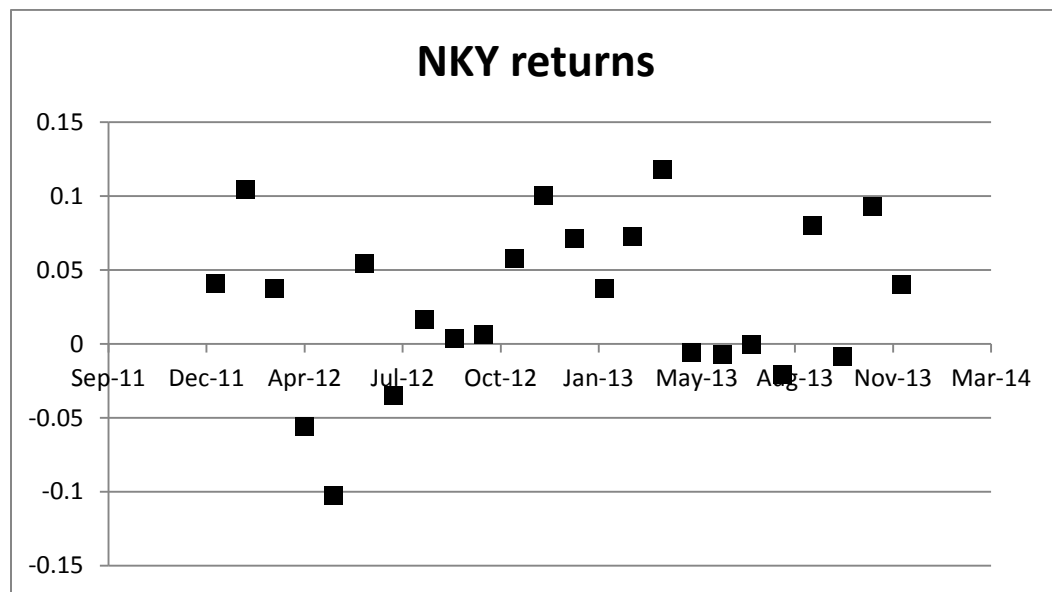


Table 1. Summary statistics

A table summarizing the data for the dependent and independent variables in my various analyses. “Sum” and “Count” are the dependent variables while all the other line items are explanatory variables. Each variable has 199 observations.

Variable	Mean	St. Error	St. Deviation	Min	Max
Sum (billions)	797.567	56.28	793.88	6.00	4,744.32
Count	24.97	0.95	13.36	1.00	73.00
JGB (%)	1.38	0.03	0.38	0.54	2.59
Call (%)	0.29	0.02	0.28	0.00	1.50
NKY Close	12771.51	233.89	3299.39	7568.42	20604.96
NKY Returns (%)	0.00	0.00	0.06	-0.24	0.13
National Debt (trillions)	732.80	13.93	196.53	360.50	1021.90
Capacity Utilization	-0.02	0.21	2.99	-21.74	14.39
Spot Rate (JPY/USD)	107.29	1.12	15.75	76.27	144.66
NKY P/E	34.35	2.64	37.30	8.84	259.78

Table 2: Results for regression 1

A table of coefficients and t-statistics for the first regression. Lag variables were not included in this analysis. The spot rate and financial crisis dummy variable were statistically significant for the *sum* regressor, while the JGB yield, call rate, Nikkei 225 level, national debt level, financial crisis dummy variable and intercept were statistically significant for the *count* regressor.

	<i>jgb</i>	<i>call</i>	<i>nky</i>	<i>debt</i>	<i>caput</i>	<i>spot</i>	<i>nkype</i>	<i>nreturns</i>	<i>crisis</i>	<i>intercept</i>
<i>sum</i>	0.13 mil (0.56)	0.17 mil (0.68)	16.53 (0.66)	0.10* (1.94)	20966 (1.11)	-13764** (-2.00)	-2853 (-1.41)	-0.19 mil (-0.19)	0.66 mil*** (2.57)	0.751 mil (0.81)
<i>count</i>	7.35*** (2.78)	10.33*** (3.60)	-0.001*** (-2.97)	6.70e⁻⁶*** (10.85)	0.24 (1.09)	-0.06 (-0.73)	-0.03 (0-1.26)	-4.32 (-0.37)	165.82*** (5.24)	-29.34*** (-2.69)

sum R²: 0.124; Adj. R²: 0.082 **count** R²: 0.570; Adj. R²: 0.550

Number of observations: 199

Note: *significant at 10%, **significant at 5%, ***significant at 1%

Table 3: Results for regression 2

A table of coefficients and t-statistics for the second regression. Lag variables were included in this analysis. Only the 2-year lagged JGB yield was statistically significant for the *sum* regressor, while the call rate, national debt level and financial crisis dummy were significant for the *count* regressor.

	<i>jgb</i>	<i>call</i>	<i>nky</i>	<i>debt</i>	<i>caput</i>	<i>spot</i>	<i>nkype</i>	<i>nreturns</i>	<i>crisis</i>
<i>sum</i>	0.60 mil (1.43)	-0.12 mil (-0.31)	-34.23 (-0.50)	0.13 (0.61)	30244 (1.52)	-11059 (-0.69)	-751.75 (-0.21)	0.22 mil (0.19)	0.22 mil (0.43)
<i>count</i>	7.82 (1.41)	11.27** (2.14)	-0.001 (-0.97)	7.04e⁻⁶** (2.45)	0.27 (1.03)	-0.01 (-0.04)	-0.02 (-0.45)	-1.36 (-0.09)	15.72** (2.31)
	<i>jgb1</i>	<i>jgb2</i>	<i>jgb3</i>	<i>call1</i>	<i>call2</i>	<i>call3</i>	<i>spot1</i>	<i>spot2</i>	<i>spot3</i>
<i>sum</i> (<i>contd</i>)	-66416 (-0.16)	-1.1 mil*** (-3.16)	-89426 (-0.26)	-85611 (-0.22)	-0.21 mil (-0.57)	-0.31 mil (0.91)	15191 (0.97)	-16013 (-1.49)	6943 (0.72)
<i>count</i> (<i>contd</i>)	1.54 (0.28)	-2.91 (-0.63)	0.53 (0.12)	4.99 (0.97)	2.55 (0.52)	6.17 (1.36)	0.03 (0.14)	-0.02 (-0.17)	0.94 (0.74)
	<i>nky1</i>	<i>nky2</i>	<i>nky3</i>	<i>nreturns1</i>	<i>nreturns2</i>	<i>nreturns3</i>	<i>intercept</i>		
<i>sum</i> (<i>contd</i>)	79.88 (1.31)	40.93 (0.82)	-10.35 (-0.19)	-1.66 mil (-1.47)	1.26 mil (1.18)	0.95 mil (0.91)	0.27 mil (0.09)		
<i>count</i> (<i>contd</i>)	0.00 (0.21)	0.00 (0.20)	-0.00 (-0.62)	-4.16 (-0.28)	-0.62 (-0.04)	15.19 (1.11)	-49.61 (-1.23)		

sum R²: 0.224; Adj. R²: 0.089 **count** R²: 0.415; Adj. R²: 0.313

Number of observations: 163

Note: *significant at 10%, **significant at 5%, ***significant at 1%

Table 4: Results for regression 3

A table of coefficients and t-statistics for the third regression. Lag variables were omitted from this analysis, and the time frame was cut down to January 2012 to December 2013. Therefore, the financial crisis dummy variable was also omitted. The capacity utilization rate was statistically significant for the *sum* regressor, and the Nikkei 225 close, national debt level and Nikkei 225 returns were statistically significant for the *count* regressor.

	<i>jgb</i>	<i>call</i>	<i>nky</i>	<i>debt</i>	<i>caput</i>	<i>spot</i>	<i>nkype</i>	<i>nreturns</i>	<i>intercept</i>
<i>sum</i>	-1.3 mil (-0.47)	-0.55 mil (-0.14)	-224.92 (-0.63)	1.59 (0.58)	0.22 mil** (2.02)	-1497 (-0.13)	-67340 (-0.38)	-2.4 mil (-0.64)	-8.9 mil (-0.34)
<i>count</i>	-22.09 (-0.87)	-0.58 (-0.02)	-0.01** (-2.58)	-4.70e⁻⁵* (-1.94)	1.33 (1.40)	2.07 (2.14)	0.47 (0.29)	-18.54*** (-2.58)	416.54 (1.79)

sum R²: 0.400; Adj. R²: 0.080 **count** R²: 0.636; Adj. R²: 0.442

Number of observations: 24

Note: *significant at 10%, **significant at 5%, ***significant at 1%