Will Japan's Three Arrows Policy Hit Its Target?

Gregory T. Polgar
Georgetown University

David A. Walker
Georgetown University

Prime Minister Abe proposed a "three arrows" monetary and fiscal program with structural reforms to stimulate the Japanese economy. Since his reelection in December, 2014, he approved a $29 billion stimulus package. This study provides a model that explains the Japanese rate of inflation as a function of important economic variables and simulates economic policies to reach the long-run goal of two percent inflation, combining a significant, continuing depreciation of the yen-dollar exchange rate, an aggressive fiscal policy, and continued monetary easing. The inflation equation is input to a Fisher Equation to determine the substantial rise in nominal interest rates required for the real return on capital to become positive.

INTRODUCTION

Japan had been mentioned as the possible comeback country as a result of some earlier economic news and Prime Minister Abe's proposed "three arrows" program – fiscal stimulus, monetary easing, and economic reform. The Japanese economy experienced negative GDP growth for the first three quarters of 2014 (*Wall Street Journal*, 2014c) and is now in a recession. In many ways, the Japanese economy continues through the lost decades that began in 1991, including the Asian economic crisis. Interest rates are low and declining (10 year government bonds paying 0.26 percent); the fiscal deficit as a ratio to GDP remains high (8.2 percent), and unemployment is 3.5 percent, more than 30 percent above the historic average of 2.68). Keynesian economists such as Krugman (2013) continue to argue that Japan is still lodged in its liquidity trap.

Recent economic data, the recession, the Bank of Japan's October 31, 2014 inflation policy adjustment, recent and potential sales tax increases, and Prime Minister Abe's December reelection and $29 billion stimulus package (*The Economist*, 2015a) provide an ideal time to develop models to simulate expectations. Many monetarists ascribe to a long run policy focus to control the rate of inflation, expecting GDP growth and unemployment to approach acceptable levels. The Japanese inflation rate has made smooth policy adjustments difficult; since 1980 the average inflation rate has been slightly above one percent, with a median of 0.6 and standard deviation (1.9, see Figure 1).

The Bank of Japan "will continue with the qualitative monetary easing, aiming to achieve the price stability target of 2 percent, as long as it is necessary for maintaining that target in a stable manner" (Bank of Japan, 2014). The Bank eased its monetary policies in 2014. At its October 31 meeting, the Bank lowered it inflation forecast (*Wall Street Journal,* 2014b).

Alesina and Summers (1993) developed the classic research showing the importance of an independent central bank to control inflation. Berger and his colleagues (2001) surveyed 35 studies that employed a variety of measures of independence and concluded that the negative correlation between inflation and central bank independence is robust. For industrialized countries, Barro found a correlation of -0.82 between central bank independence and inflation (1997, p. 111).

This study presents a time series model to represent the Japanese rate of inflation as a function of traditional economic variables. The model recognizes the particular roles of international trade balances and the yen-dollar exchange rate. Potential impacts of a number of exogenous factors are tested such as periods of Japanese quantitative easing, years before and after legislation formally established the independence of the Bank of Japan in 1998, impacts of Japanese and U.S. recessions, the effect of the Reinhart-Rogoff concern for debt in excess of 90 percent of GDP (which Japan has had every year since 1995), and possible distinctions of periods for the lost decade or decades.

The inflation model is applied to simulate what economic stimuli would be necessary for the Japanese economy to reach the Prime Minister's goals. The results are not encouraging; ceteris *paribus*, the yen would need to depreciate approximately 48 yen per U.S. $1 below the January, 2015 exchange rate (65 yen below the year-end 2014 rate) for the government to reach its inflation target of two percent – a level that seems infeasible, or at least highly challenging, for political and economic reasons.

Expected inflation is an input to a Fisher Equation to examine the Japanese real return on capital. Nominal fixed interest rates are represented by an index of A+ rated Japanese corporate fixed income securities, to illustrate necessary real returns on capital to attain Prime Minister Abe's inflation rate goal of 2.0.

The study does not attempt to capture Prime Minister Abe's third arrow – structural reform. In June 2013 (Abe, 2013), the Prime Minister announced plans that disappointed many who had hoped for more significant changes. The impacts of his December, 2014 stimulus package (*The Economist,* 2015a) and June, 2014 structural reform and corporate governance plans (*The Economist*, 2014) and sales tax increases remain to be seen.

The inflation model is developed in Section II and estimated in Section III. Section IV provides simulations of the Prime Minister's "three arrows" and expected real returns on capital, applying the Fisher equation. The Conclusions follow in Section V.

DETERMINANTS OF INFLATION

Ito and Miskin (2006) blame failed monetary policy for the weak Japanese economy since before the Asia crisis, and McCallum (2003) found Japanese monetary policy for 1991 – 2001 to be ineffective. Krugman (2013) argues that fiscal policy must be the primary policy approach for Japan to return to be an economic superpower. Two of the "three arrows" rely on monetary and fiscal stimuli to strengthen the Japanese economy.

The inflation model tests impacts of important economic variables on Japanese inflation, and the potential to reach the Bank of Japan's two percent inflation target. There is a wealth of sophisticated literature that analyzes the effectiveness of monetary policy when interest rates and/or inflation are low and an economy is in a liquidity trap. Among them are studies by Bernanke and Reinhart (2004), Eggertsson (2010), Ito and Miskin (2006), Iwamura, Kudo, and Watanabe (2006), and Reifschneider and Williams (2000).

On April 4, 2013 the Bank of Japan announced a number of measures to end deflation, which has afflicted the country's economy for almost two decades. These included increasing the monetary base by 60-70 trillion yen per year, purchasing long-term Japanese government bonds at a monthly rate of 7 trillion yen, extending the average maturity of securities holdings from three to seven years, purchasing more risky assets, and targeting inflation at 2% (Bank of Japan, 2013, April 4). Bank Deputy Governor Hiroshi Nakaso indicated that additional bold easing policies were no longer necessary. (Ito and Nakamichi, *Wall Street Journal.* June 29-30, 2013, page A13); the June 2014 policy did not change (Bank of Japan, 2014). The Bank revised its inflation forecasts downward significantly at its October 31, 2014

meeting and Governor Kuroda proposed that the Bank expand its inflation package substantially (*Wall Street Journal*, 2014b).

Potential Impacts on Inflation

A variety of factors are hypothesized to explain and analyze Japanese inflation goals and policy implications of the "three arrows" (*The Economist*, May 18, 2013).

Current Account Balance (CURR)

Japan relies heavily on exports and has a modest positive balance of 0.2 percent of GDP. A larger current account surplus, which could indicate higher exports, could encourage price increases, higher wage demands, and inflation. A decreasing trade balance could indicate increasing domestic demand for goods, which can increase wage pressure and subsequently encourage inflation.

Debt/GDP Ratio (DEBTR)

Japan's public sector debt-to-GDP ratio is currently the highest among the G-7 countries projected to be 246 percent for 2015 (*Wall Street Journal*, 2014c), which reduces resources available to the private sector, and crowds out private sector investment. (The current deficit-to-GDP ratio is 8.2 percent.) With a high debt ratio, the government will face pressure to reduce expenditures to assuage bond investors' concerns and conservative politicians' positions. This reduces government demand for goods, making the labor market more reliant on the private sector. High unemployment reduces wage pressure at a national cost.

The Reinhart – Rogoff hypothesis that a debt ratio above 90 percent of GDP discourages economic growth is represented by a binary variable. Since 1995, Japan's ratio of debt-to-GDP has exceeded 90 percent. Japan increased its consumption tax in April 2014 and may do so again. The Bank of Japan supported an increase in the sales tax from 5 to 8 percent in April 2014 higher tax that Prime Minister Abe had considered (*Wall Street Journal*, 2013d).

Savings Ratio (SAVR)

The Japanese people have a history of high savings rates, which is common throughout Asia. The savings rate for Japan is one of the highest among G-7 countries.

Consumers who accumulate more aggregate savings may be more likely to purchase expensive homes and luxury goods at inflated prices. As an alternative, more savings could lead to lower inflation in anticipation of higher taxes and weaker demand (lower consumption), which discourages price increases.

Yen – Dollar Exchange Rate (EXR)

The value of the yen has a significant impact on the Japanese inflation rate and domestic and export prices for two reasons. First, with a relatively small domestic market, Japan relies on exports to stimulate economic growth. Secondly, Japan has limited natural resources, requiring businesses to purchase raw materials from abroad to meet production needs. For the purposes of this paper any increase in EXR is represented by depreciating the yen against the U.S. dollar.

Discount Rate (DR)

The discount rate, set by the Bank of Japan, is perfectly correlated (0.99) with the Japanese short-term overnight lending rate that is determined in financial markets and with 10-year government bond rates. High rates translate into high costs of borrowing for Japanese companies and less liquidity in the market. Lower discount and lending rates reduce corporate and consumer borrowing costs and increase liquidity, which should encourage business investment. When unemployment is high, lower rates should not encourage inflation, but when unemployment declines to a moderate level, higher rates are usually passed along to borrowers and inflation is expected. The discount rate and 10-year Treasury rate can be proxies for other interest rates that also affect inflation.

Money Supply (M=M2)

The quantity theory of money dictates a positive correlation between a country's money supply and its inflation rate. The essence behind the Bank of Japan's monetary policies, and the monetary policies of many central banks that are continuing to grapple with slow growth following the global financial crisis, is to increase the money supply by purchasing long-term treasury bonds and other assets, currently referred to as "quantitative easing." While countries are still exiting the financial crisis, quantitative easing has not led to inflation, but central banks are vigilant about the likelihood of increasing inflation and prices.

Characteristics of the Economy

Annual data from the IMF database, the World Bank, and the Bank of Japan are employed to develop Japanese inflation models for 1980 – 2012 for inflation (INFL), as a function of the current trade balance (CURR), the ratio of debt-to-GDP (DEBTR), the nominal yen – dollar exchange rate (EXR), the savings ratio (SAVR), and the discount rate (DR). DR is representative of numerous other Japanese interest rates because they are highly correlated. Annual data avoid seasonality and short-term fluctuations. The definitions and characteristics of the variables are provided in Figure 1.

For most of the variables, the dispersion is wide relative to averages. For inflation, the median is 0.60, well below the mean of 1.03, and the standard deviation is 1.87 percent, well above the mean. For the discount rate, the median is 0.62 and the mean is 2.13, reflecting how many years the Japanese discount rate was close to zero. For 16 of the 33 years the discount rate was no higher than 0.50, and has been 0.30 since 2009.

INFLATION MODELS

Inflation models are estimated employing the variables that are delineated in section II as potential explanatory factors for annual inflation for Japan. Previous studies, articles, and potential policy actions form the basis for the numerous OLS models that have been estimated, including an AR(1) term to remove autocorrelation. Iwamura, Kudo, and Watanabe (2006) discuss the use of monetary policy as a version of inflation targeting for Japan to escape its liquidity trap. Krugman (2013) has argued that traditional monetary policy is not an effective approach for Japan to escape its years in the liquidity trap. Forni, et. al. (2003) show sophisticated inflation forecast models are superior to univariate models.

Estimated Inflation Models

The inflation model that is the best statistical fit is model 1 in Figure 2 in which 85 percent of the variation in inflation is explained by four variables. Each has a statistically significant coefficient at the 0.01 percent level, the F-statistic is high (36.10), and much of the autocorrelation is removed (Durbin-Watson statistic = 2.15).

Higher savings, as a precursor to expected higher taxes; larger fiscal debt ratios; and a depreciating yen relative to the dollar induce higher prices and inflation. If aggregate demand is elastic, prices rise more rapidly than aggregate consumer and business demands decline, resulting it inflation. A lower current trade balance (with greater resource imports) encourages inflation; however, imports have not exceeded exports in the past 30 years (see Figure 1). The significant, positive coefficient of the yen-dollar exchange rate suggests that the yen has been overvalued in global markets, leading to lower Japanese inflation.

Tests of Alternative Issues

Model 1, with strong statistical characteristics, is a basis to test other factors that could have influenced Japanese inflation since 1980. Models 9 and 10 show that neither the level nor changes in M2 have a statistically significant coefficient at any meaningful level to explain inflation. The autoregressive coefficient and a separate regression for M2 as a function of time show M2 reflects the time trend for the money supply.

Models 2 – 8 in Figure 2 report significance tests of coefficients of binary variables constructed to represent:

(i) Whether Japanese inflation was affected by the Bank of Japan's quantitative easing policy (2001-2005) or (2001-2012)?
(ii) Whether inflation was uniquely affected within the 1991-2000 "lost decade"?
(iii) Whether the "lost years," represented by 1991-2000 or by 1991-2012, were unique?
(iv) Whether Japanese inflation was uniquely affected, when the country's debt ratio exceeded 90 percent of GDP, as Reinhart and Rogoff hypothesize?
(v) Whether the U.S. recession influenced Japanese inflation?
(vi) Whether Japan's inflation was affected by the Federal Reserve's quantitative easing?

The empirical results of these six tests can be summarized very simply. None of the factors described in (i) – (vi) and represented by binary variables have a statistically significant coefficient at any meaningful level. Each t-statistic for the coefficient of the binary variable is less than 1.0, except when either the Bank of Japan or Federal Reserve quantitative easing is included (t=-1.13) and the negative sign indicates that neither banks' "easing" had an inflationary impact on Japan's economy. The possibility that the Bank of Japan or U.S. quantitative easing might have an impact on the coefficients of independent variables in Model 1 was also tested by interacting the binary variable with the variables in Model 1. None of the coefficients are statistically significant at any meaningful level. During a deep recession, inflation rarely reacts to changes in central bank policy or the independence of the central bank (see Berger et. al., 2001).

The binary variable representing a debt ratio above 90 percent of GDP does not have a statistically significant coefficient (t-statistic of -0.14, model 6; -1.51, model 7). The model is estimated excluding and including the debt ratio (models 6 and 7, respectively). The correlation between the debt ratio and the Rogoff binary variable (debt ratio > 90 percent) is 0.85 for Japan.

REAL RETURNS

The primary inflation model (Model 1, Figure 2) is the basis to analyze Japan's real return on capital, applying the Fisher equation. Eggertsson and Krugman (2012) and Ireland (2000) review debt and short-term U.S. interest rates, respectively, in relation to actual and expected inflation, consistent with traditional Fisher models. Granville and Mallick (2004) conclude that the Fisher hypothesis fits the UK on the basis of time-series data throughout the 20th century.

Expectations

A simple Fisher equation is adopted, where the real return on capital, r, equals the nominal interest rate, i, minus the expected rate of inflation, E(INFL).

$$r = i - E(INFL)$$

where INFL = -24.97 + .70 SAVR + .04 DEBTR -.57 CURR + .02 EXR + .37 e_{t-1}

The e_{t-1} for 1980 – 2012 are fitted to a probability distribution using @RISK. The Gumbel Distribution is the best fit for e_{t-1}, on the basis of a minimum Chi-square statistic. e_{t-1} has extreme values with a range from -0.8162 to 1.0285 and a standard deviation approximately 60 times its mean. The fitted Gumbel Distribution has a location parameter of -0.249 and scale of 0.455. The characteristics of the fitted distribution are: mean = 0.0136, median = -0.6155, standard deviation = .5836, and skewness = 1.14. If E(.37 e_{t-1}) were represented by its mean .37 E(e_{t-1}) =.37 x 0.0136 =.005. If E(e_{t-1}) were represented by its median, .37 E(e_{t-1}) = -.278.

$$E(INFL) = -24.97 + .70\,E(SAVR) + .04\,E(DEBTR) - .57\,E(CURR) + .02\,E(EXR) + .37\,E(e_{t-1})$$

The other terms in the inflation equation require some judgment to represent "expected values" for future policy judgments. The value that would be "expected" for each variable is not necessarily the mean of the variable over the previous 32 years for which the model is estimated.

Expected Inflation

Several alternatives follow for E(INFL) to examine the return on capital and policy considerations. The mean of $E(e_{t-1})$ is employed in the calculations; however, if the median were used, E(INFL) would be smaller by -0.273 (-0.278 + .005). For the independent variables in E[INFL], the first three cases represent: [1] means of 1980 – 2012; [2] medians of 1980 – 2012; and [3] year-end 2013 values.

[1] Independent variables equal their 1980-2012 means:
DEBTR= 121.25, SAVR = 28.81, CURR = 2.55, EXR = 137.71, E(INFL) = 0.81

[2] Independent variables equal their 1980-2012 medians:
DEBTR= 98.97, SAVR = 30.01, CURR = 2.69, EXR = 121.06, E(INFL) = 0.19

[3] Independent variables equal their year-end 2013 values (and IMF estimates):
DEBTR= 243.54, SAVR = 21.89, CURR = 0.90, EXR = 102, E(INFL) = 0.75

Cases [1], [2], and [3] are simulations that provide small positive estimates for E(INFL).

Case [4] is the same as [3] with a significantly lower debt ratio where the economic policy focus would probably be monetary policy. If the debt ratio were reduced substantially and the other variables remain at their 2013 levels, Japan would be expected to return to deflation.

[4] Independent variables equal their year-end 2013 values and a reduced debt ratio:
DEBTR= 200.0, SAVR = 21.89, CURR = 0.90, EXR = 102, E(INFL) = -0.86

Fiscal policy is critical for Prime Minister Abe's "three arrows" to hit their targets. Eggertsson (2010), Iwamura, et. al. (2006), and much of Krugman's research (1998, 2005, and 2013) argue that fiscal policy must be a major aspect of any policy to bring Japan out of their lost years. Case [4], however, is not a realistic policy alternative.

Case [5] employs year-end 2013 data with a 25 percent yen-dollar devaluation from year-end 2013 (102 to 127). E(INFL) = 1.22.

[5] Independent variables equal year-end 2013 values, with a three percent devaluation:
DEBTR= 243.54, SAVR = 21.89, CURR = 0.90, EXR = 127, E(INFL) = 1.22

Case [6], where E(INFL) = 1.97, represents the year-end 2013 data with a yen –U.S. dollar currency devaluation of 60 percent (102 to 167). There are other approaches to reach E(INFL) = 2.00, but they generally involve policy changes that cannot or will not occur.

[6] Independent variables equal year-end 2013 values, with a 60 percent currency devaluation:
DEBTR= 243.54, SAVR = 21.89, CURR = 0.90, EXR = 167, E(INFL) = 1.97

If there were a currency devaluation of 100 percent from year-end 2013, EXR = 205, then E(INFL) = 3.85.

Fisher Equations and Real Returns on Capital

The mean Japanese 10-year Treasury security rate for 1980 – 2012 was 3.40, the median was 2.00, and the latest rate is 0.26. For any "normal" nominal interest rate, Cases

[1] – [5] provide a miniscule or negative real return on capital. For year-end 2013 values, Case [3], the real return, based on the nominal Treasury security rate would be -0.14 (.61 - .75). For Case [5], the real return would also be negative. Case [4] versus [5] illustrates the argument by Eggertsson and Krugman (2012) that debt deleveraging (a reduction in DEBTR) depresses aggregate demand – the well-known "paradox of thrift" - especially in a liquidity trap.

Case [6] provides E(INFL) = 1.97, which is the Prime Minister's target. This represents a 60 percent yen-dollar devaluation with year-end 2013 data for the other variables.

At the end of 2013, Japanese A+ rated corporate bonds have a current return of approximately 1.20 percent (private communication), almost 59 basis points above the year-end 2013 ten-year Treasury security. Narioka (2013) reports that major Japanese corporations aspire to issue bonds at between 30 and 50 basis points above the Treasury rate, so the difference is reasonable.

For a corporate bond paying 1.20 percent, for Case [3] the real rate would be

r = 1.20 –E(INFL) = 1.20 – 0.75 = 0.45. For Case [5], r = 1.20 – 1.22 = -0.02 and for Case [6],

r = 1.20 – 1.97 = -0.77. These real returns could not be expected to attract domestic or foreign investment. The foreign direct investment into Japan is below that for any of the G-7 countries. Thus, increasing the expected inflation rate, E(INFL), requires a large increase in treasury and corporate bond rates to reach a modest real return on capital.

Cases [7] and [8] include a higher debt ratio of 275 percent of GDP, which would be an expansionary fiscal policy, and contrast the year-end 2013 yen-dollar exchange rate with a 25 percent devaluation, from 102 to 128. E[INFL] becomes 1.90 and 2.38, respectively.

[7] Independent variables equal year-end 2013 values, with an increased debt ratio:
DEBTR= 275.00, SAVR = 21.89, CURR = 0.90, EXR = 102, E(INFL) = 1.92

[8] Independent variables equal year-end 2013 values, increased debt ratio and 25 percent currency devaluation:
DEBTR= 275.00, SAVR = 21.89, CURR = 0.90, EXR = 128, E(INFL) = 2.38

CONCLUSIONS

The inflation model presented here and its implications for real returns on capital show Prime Minister Abe faces a difficult period following his reelection and that a long run perspective will be needed. Abe's proposed "three arrows" policy to stimulate the economy is not likely to bring Japan out of 20 years of stagnation and low economic growth without significant yen-dollar devaluation (Coenen and Wieland, 2003). Moreover, the Prime Minister's third arrow is "quivering" as a result of his modest plans for structure reform. Yet, despite the Bank of Japan's continued 2014 monetary easing policy and Japan's fiscal debt above the other G-7 countries, Japan still grapples somewhat with stagnant prices, modest economic growth, and small returns on capital.

A modest currency devaluation will have a positive effect on exports and GDP growth as well as increasing the rate of inflation toward the two percent target, but even a 25 percent yen depreciation from year-end 2013 (102) to 127 would only increase expected inflation to approximately 1.22. The current exchange rate of 119 has had little positive impact. A 60 percent currency devaluation from year-end 2013, from 102 to 167, coupled with the year-end 2013 debt ratio would increase expected inflation to 1.97 percent. Economic progress is likely to be slow and reaching a return on capital that will attract domestic and foreign investment capital will require patience and consistent expansionary policies.

Successful implementation of the "three arrows" initiative will require legislative and executive branch cooperation for (1) significant deprecation of the yen against the dollar, (2) fiscal stimuli, as Keynesians recommend to escape the liquidity trap, and (3) continued Bank of Japan easy monetary policy. None of the three approaches alone is likely to return the Japanese economy to its performance before the asset price bubble in 1991.

REFERENCES

Abe, S. (2013). The third round of policies under the growth strategy. Speech at the Research Institute of Japan, Tokyo. June 5.

Alesina, A. & Summers, L. H. (1993). Central bank independence and macroeconomic performance: some comparative evidence. *Journal of Money, Credit, and Banking.* 25:151-162.

Bank of International Settlements. BIS Effective Exchange Rate Indices.

Bank of Japan. (2014). Statement of monetary policy. June 13.

Bank of Japan. (2013). Introduction of the quantitative and qualitative monetary easing. April 4.

Bank of Japan. Main-time series statistics.

Barro, R. J. (1997). *Determinants of Economic Growth: A Cross-Country Empirical Study.* MIT Press, Cambridge, MA.

Berger, H., de Haan, J. & Eijffinger, S. C. C. (2001). Central bank independence: an update of theory and evidence. *Journal of Economic Surveys.* 15:3-40.

Bernanke, B. & Reinhart, V. R. (2004). Conducting monetary policy at very low short-term interest rates. *The American Economic Review.* 94:85-90.

Coenen, G. & Wieland, V. (2003) The zero-interest–rate bond and the role of the exchange rate for monetary policy in Japan. *Journal of Monetary Economics*. 50:1071-1101.

Di Tella, R., MacCulloch, R. J. & Oswald, A.J. (2001). Preferences over inflation and unemployment: evidence from surveys of happiness. *The American Economic Review*. 91:335-341.

The Economist. (2015a). Japan's economy: pump-priming. January 3, p. 59.

The Economist. (2015b). Economic and financial indicators. January 17, p. 88.

The Economist. (2014). Reform in Japan: the third arrow. June 28, p. 12.

The Economist. (2013a). Japan's master plan. May 18, p. 13.

The Economist. (2013b). Briefing Japan and abenomics: once more with feeling. May 18, pp. 24-25.

The Economist. (2013c). The third arrow of abenomics: misfire. June 19, pp. 37-38.

Eggertsson, G. B. & Krugman, P. (2012). Debt, deleveraging, and the liquidity trap. *Quarterly Journal of Economics.* 127:1469-1513.

Fatas, A., Mihov, I. & Rose, A.K. (2007). Quantitative goals for monetary policy. *Journal of Money, Credit and Banking.* 39:1163-1176.

Fisher, I. (1930). *The Theory of Interest*. Macmillan. New York City.

Forni, M., Hallin, M., Lippi, M. & Reichlin, L. (2003). Do financial variables help forecasting inflation and real activity in the Euro Area? *Journal of Monetary Economics*. 50:1243-1255.

Granville, B. & Mallick, S. (2004). Fisher hypothesis: UK evidence over a century. *Applied Economics Letters*. 11: 87-90.

Gurkaynak, R., Sack, B. & Swanson, E. (2005). The sensitivity of long-term interest rates to economic news: evidence and implications for macroeconomic models. The *American Economic Review*. 95:425-436.

International Monetary Fund. (2012). MF, World Economic Outlook Database, www.imf.org.

International Monetary Fund. (2013). *International Financial Statistics*, www.imf.org.

Ireland, P.N. (2000). Interest rates, inflation, and federal reserve policy since 1980. *Journal of Money, Credit and Banking*. 32:417-434

Ito, T. & Miskin, F.S. (2006). Two decades of Japanese monetary policy and the deflation problem. in *Monetary Policy Under Very Low Inflation in the Pacific Rim*, Ito, T & Rose, A. K. eds., June 25-27, University of Chicago Press. Chicago.

Ito, T. (2006). Japanese monetary policy: 1998-2005 and beyond. Bank of International Settlements. BIS Papers No. 31.

Ito, T. & Nakamichi, T. (2013). Bank of Japan done easing, for now. *Wall Street Journal.* June 29-30, p. A13.

Iwamura, M., Kudo,T. & Watanabe,T. (2006). Monetary and fiscal policy in a liquidity trap: the Japanese experience, 1999- 2004. in *Monetary Policy Under Very Low Inflation in the Pacific Rim*, Ito, T. & Rose, A.K. eds., June 25-27, University of Chicago Press. Chicago.

Krugman, P. (2013). Monetary policy in a liquidity trap. *New York Times*. April 11.

Krugman, P. & Obstfeld, M. (2009). *International Economics: Theory & Policy*. 8th ed. Pearson: Addison Wesley.

Krugman, P. (1998). Japan's trap. Princeton University. www.princeton.edu/~pkrugman/japans_trap.

Krugman, P. (2005). Is fiscal policy poised for a comeback? *Oxford Review of Economic Policy.* 21:515-523.

McCallum, B. T. (2003). Japanese monetary policy. *Economic Quarterly*, Federal Reserve Bank of Richmond. 89:1-31.

Misun, J. & Tomsik, V. (2002). Does foreign direct investment crowd in or crowd out domestic investment. *Eastern European Economics.* 40: 38-56.

Mogi, C. & Sano, H. (2013). As Japan insurers flirt with foreign bonds, yields may move more than yen. Reuters. April 25.

Narioka, K. (2013). Japan corporate bond issuance hits 3-year high. wsj.com, May 14.

Reifschneider, D. L. & Roberts, J.M. (2006). Expectations formation and the effectiveness of strategies for limiting the consequences of the zero bound. *Journal of the Japanese and International Economies.* 20:314-337.

Reifschneider, D. & Williams, J.C. (2000). Three lessons for monetary policy in a low-inflation era. *Journal of Money, Credit, and Banking.* 32: 936-966.

Reinhart, C.M. & Rogoff, K. (2009). *This Time Is Different: Eight Centuries of Financial Folly*, Princeton University Press, Princeton, NJ.

Taylor, J.B. (2013). The effectiveness of central bank independence versus policy rules. American Economics Association Annual Meeting session on Central Bank Independence: Reality or Myth? San Diego, CA.

Taylor, J.B. (2009). The lack of an empirical rationale for a revival of discretionary fiscal policy. *American Economic Review: Papers & Proceedings.* 99:550-555.

Wall Street Journal. (2014a). Japan's decision on increasing sales tax to resonate globally. October 13, p. A2.

Wall Street Journal. (2014b). Behind the bank of Japan's inflation decision. November 10, p. A14.

Wall Street Journal. (2014c). Japanese economy slides into recession. November 17, p. A1.

Wall Street Journal. (2013a). Japan's premier lines up new overhauls. June 5, p. A9.

Wall Street Journal. (2013b). Vote empowers Abe to pursue vision for new postwar Japan. July 22, p. A1.

Wall Street Journal. (2013c). Japan's consumer prices jump, pointing to recovery. August 31 – September 1, p. A9.

Wall Street Journal, (2013d). Bank of Japan pushes for increase in sales tax. September 6, p. A16.

World Bank. Country GDP Data, www.wb.org.

Wynne, M. A. & Kersting, E.K. (2009). Trade, globalization and the financial crisis. *Economic Letter,* Federal Reserve Bank of Dallas, November.

FIGURE 1
CHARACTERISTICS OF THE DATA

	Mean	Median	Standard Deviation	Maximum	Minimum
Inflation Rate	1.03	0.60	1.87	7.81	-1.34
Debt-to-GDP Ratio	121.25	98.97	59.84	236.56	50.63
Nominal Exchange Rate	137.71	121.06	50.23	249.06	79.70
Savings Ratio	28.81	30.01	3.47	33.83	21.88
Current Account Balance	2.55	2.69	1.17	4.87	-0.99
GDP Growth Rate	2.10	2.21	2.56	7.15	-5.53
M2 Money Supply	5.47	5.61	1.80	8.45	2.16
Discount Rate	2.13	0.62	2.22	7.25	0.10
10 Year Govt. Bond	3.40	2.00	2.47	8.66	0.84
%□Money Supply	4.69	3.16	3.43	11.66	0.59
%□Output	1.98	1.21	3.38	7.38	-6.38
%□Debt-to-GDP Ratio	4.62	6.02	3.99	10.77	-4.54

Variable Definitions:

Current Account Balance: Current account is all transactions other than those in financial and capital items. Source IMF.

Debt-to-GDP Ratio: Gross debt consists of all liabilities that require payment or payments of interest and/or principal by the debtor to the creditor at a date or dates in the future. Source IMF.

Nominal Exchange Rate: U.S Dollar/Yen Spot Rate at 1700 in JST, Average in the Month, Tokyo Market. To annualize data, the spot rate for January of each year is used. Source Bank of Japan.

GDP Growth Rate: Annual percentages of constant price GDP are year-on-year changes. Source IMF.

Inflation Rate: Annual percentages of average consumer prices are year-on-year changes. Source IMF.

Discount Rate: Bank of Japan official discount rate.

M2 Money Supply: M2 Japan (in Yen) from Federal Reserve Bank of St. Louis, FRED@ data base.

Savings Ratio: Expressed as a ratio of gross national savings and GDP, both in current local currency. Source IMF.

Lost Decade 1991-2000: Binary variable accounts for Japan's lost decade as 1991-2000.

Lost Decade 1991-2012: Binary variable accounts for Japan's lost decade as 1991-2012.

U.S. Recession: Binary variable that accounts for U.S. recessions, with dates derived from the National Bureau of Economic Research.

U.S. Quantitative Easing: Binary variable accounts for U.S. quantitative easing, which is from 2008-2012.

Debt Ratio > 0.90: Binary variable that accounts for when Japan's Debt-to-GDP ratio was greater than 90 percent, which is from 1995-2012.

Japan Quantitative Easing: Binary variable that accounts for Japanese quantitative easing, specifically when the Bank of Japan last used the monetary base as its main operating target (2001-2005)

FIGURE 2
REGRESSION MODELS – DEPENDENT VARIABLE = INFLATION

Model	Intercept	Savings Ratio (SAVR)	Debt Ratio (DEBTR)	Current Account Balance (CURR)	Nominal Exchange Rate (EXR)	Alternative Variable	AR(1)	Adj. R^2 / F-Statistic/ D-W
1	**-24.966** -4.94***	**0.699** 5.31***	**0.037** 3.93***	**-0.567** -3.64**	**0.019** 3.98***	**N/A**	**0.371** 3.20**	**0.85** 36.10*** 2.15
2	**-24.755** -4.57***	**0.693** 4.87***	**0.037** 3.60**	**-0.563** -3.45**	**0.019** 3.88***	**U.S. Recession** **0.038** 0.13	**0.369** 3.09**	**0.84** 28.95*** 2.15
3	**-24.714** -4.97***	**0.688** 5.30***	**0.037** 4.06***	**-0.571** -3.75***	**0.020** 4.26***	**U.S. Quantitative Easing** **-0.420** -1.13	**0.341** 2.8**	**0.85** 30.57*** 2.19
4	**-26.441** -5.05***	**0.718** 5.45***	**0.040** 4.04***	**-0.574** -3.65**	**0.022** 3.79***	**Lost Decade (1991-2000)** **0.362** 0.94	**0.366** 3.12**	**0.85** 30.11*** 2.22
5	**-25.546** -5.00***	**0.704** 5.34***	**0.036** 3.87***	**-0.577** -3.63**	**0.021** 3.81***	**Lost Decade (1991-2012)** **0.364** 0.76	**0.370** 3.12**	**0.85** 29.69*** 2.18
6	**-5.576** -2.07*	**0.218** 2.61*	**N/A**	**-0.273** -1.51	**0.006** 1.06	**Debt Ratio > 0.90** **-0.142** -0.22	**0.435** 3.53**	**0.76** 20.87*** 1.83
7	**-24.362** -4.95***	**0.685** 5.33***	**0.040** 4.31***	**-0.586** -3.89***	**0.018** 3.78***	**Debt Ratio > 0.90** **-0.716** -1.51	**0.351** 2.98**	**0.86** 31.90*** 2.24
8	**-24.714** -4.97***	**0.688** 5.30***	**0.037** 4.06***	**0.020** 4.26***	**-0.571** -3.75***	**Japan Quantitative Easing** **-0.420** -1.13	**0.341** 2.86**	**0.85** 30.57*** 2.19
9	**-24.740** -4.80***	**0.673** 4.52***	**0.032** 1.98	**-0.542** -3.16**	**0.020** 3.10**	**M2** **0.002** 0.35	**0.386** 3.08**	**0.84** 29.10*** 2.23
10	**-25.138** -5.20***	**0.705** 5.55***	**0.038** 4.21***	**-0.624** -3.90***	**0.020** 4.91***	□M2 **-0.007** -0.66	**0.186** 1.01	**0.80** 21.05 1.71

***significant at the .001 level; **significant at the .01 level; *significant at the .05 level; +significant at the .10 level

Note: The second number in each cell represents the coefficient's t-statistics, or F-statistic for adjusted R-squared. The third number in the last column represents the Durbin-Watson statistic.