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Demographic Shifts and Asset Returns in Japan

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Abstract

Using monthly data this paper examines the effects of changes in the dependence ratio and M3 broad money supply in the current period on the mean and variance of stock returns and bond yields in Japan in the next period, controlling for financial crisis, stock returns in USA, unemployment rate, real exchange rate, oil prices, and industrial production. We apply the post-LASSO OLS, quantile regression, Johansen (1995) cointegration test, and GARCH processes. In post-LASSO OLS, dependence ratio for the old, financial crisis, stock returns in USA, and growth rate in M3 money supply are the significant determinants of mean stock returns in Japan. A non-linear relationship exists between mean stock returns and growth rate in dependence ratio for the young and the old, industrial production index and long-term government bond yields. The VECM identifies dependence ratio as a significant long-run determinant of mean stock prices. In GARCH, dependence ratio has no significant impact on the volatility in stock returns. OLS and quantile regressions identify financial crisis and growth rate in M3 money supply as significant determinants of long-term bond yields. Quantile regression identifies growth rates in dependence ratio for the old and M3 money supply as significant determinants of the volatility in lower tail of the conditional distribution of long-term bond yields. Thus demographic shifts and monetary easing are found to have significant effects on asset returns in Japan.

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1. Introduction

The life-cycle hypothesis and the overlapping generation model posit that population aging can significantly affect asset prices. According to the life-cycle hypothesis proposed by Modigliani and Brumberg (1954), an individual lives through three phases, namely, young, middle and old; consequently, consumption and saving patters vary by age. When the individuals are young, they participate in the labor market. However, their labor income is often insufficient to meet their expenses; therefore, the individuals borrow when they are young. As labor income increases and the individual reaches middle age, savings also increase and so does the accumulation of assets. Asset prices are expected to rise. When the individual reaches the old age, there is no labor income. Dissaving and decumulation of assets in order to finance consumption in old age are expected to drive down asset prices. In an overlapping generation model proposed by Allias (1947), Samuelson (1958) and Diamond (1965), at any given point of time, two generations, namely, the young and the old, coexist. The young generate savings for the future by buying assets, while the old finance retirement by selling their assets. In this scenario, a change in the size of buyers of assets (the young) relative to the size of the sellers of assets (the old) can have a significant impact on asset prices. If the size of the working population as a percentage of total population increases, then asset prices are expected to rise. If the population is ageing, i.e., if the young generation is becoming relatively smaller, then asset prices are expected to fall. As Poterba (2001) argued, an increase in the size of the working population will drive up asset prices, while a decrease in the size of the working population will drive down asset prices. A large birth cohort will purchase assets at high prices and sell assets at low prices, thereby earning a low rate of return on investment. In both life-cycle hypothesis and overlapping generation model, therefore, population ageing is expected to lead to a fall in asset prices. A demographic shift from the young to the old would also lead to changes in risk preferences. If individuals become more risk averse with increased age, they would reallocate their resources from stocks to bonds; consequently, stock prices would fall.

In recent times, the socio-economic effects of the decline in the Japanese population has been the focal point of discussion in academic and policy circles. Is empirical data on population ageing and stock returns in Japan consistent with the theoretical predictions of the life cycle hypothesis and the overlapping generations model? Japan presents an interesting case study. The monthly data from the Statistics Bureau of Japan shows that, from October 2007 until October 2018, the dependence ratio, which is the sum of older and younger dependents to the working age population, increased sharply. The data is presented in Figure 1. During this same period, monthly data from the Federal Reserve Bank of St. Louis shows that, the 10-year long-term government bond yields in Japan declined steadily. But the total share prices for all shares in Japan (index 2015 = 100) increased. This data is presented in Figure 2. Figure 3 also presents the log of the total share prices for all shares in Japan (represented by the blue line). The correlation coefficient between the share price index and the dependence ratio is 0.76. The correlation coefficient between the log of the share price index and the dependence ratio is 0.74; therefore, an increase in the dependence ratio from 2007 until 2018 coincided with an *increase* and not a decrease in share prices, which contradicts the predictions of the life cycle and overlapping generations models.

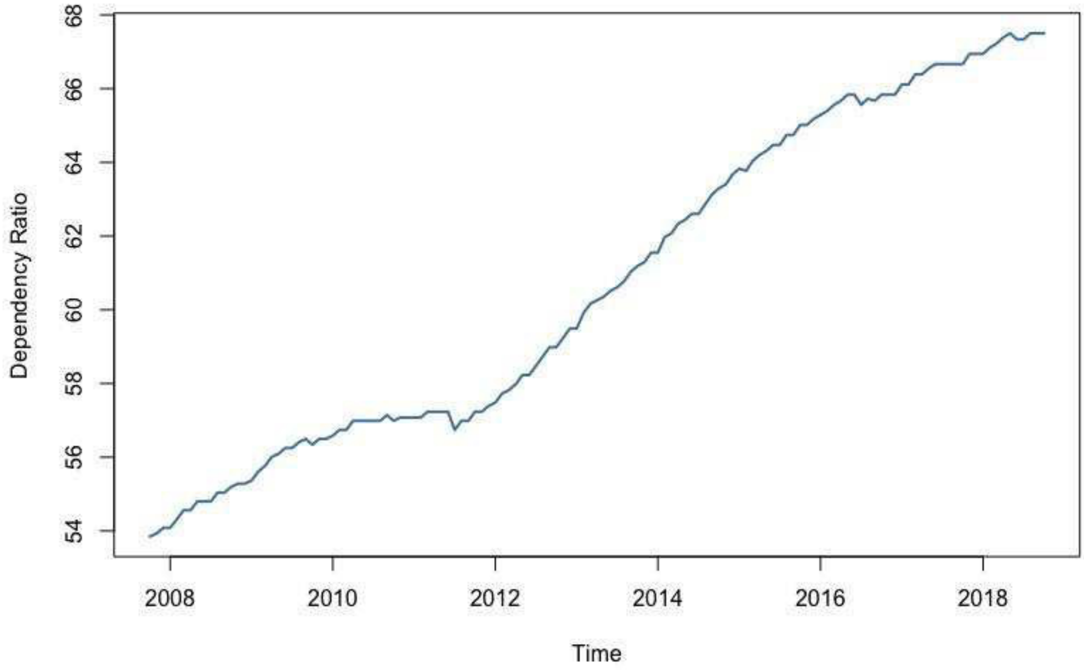

Figure 1. Dependency Ratio for Young and Old in Japan

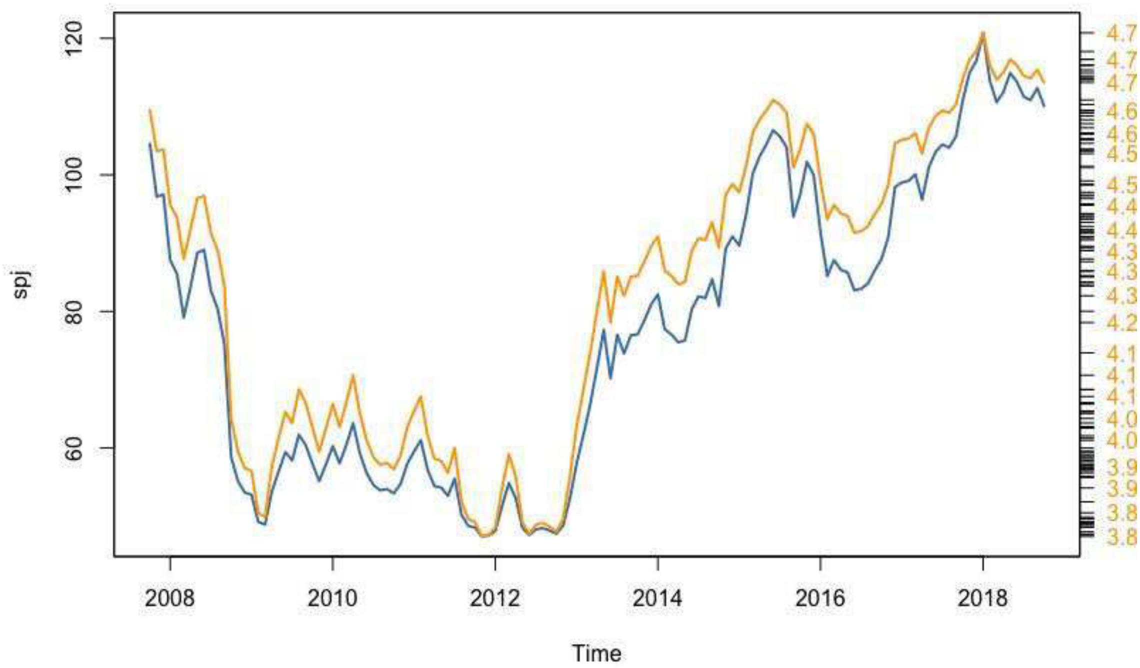

Figure 2. Total Share Prices in Japan

Although Figure 3 appears compelling, Brooks (2006) argued that the data on share prices must be interpreted with caution because it does not account for other important factors that may have driven both demographics and share prices. For instance, in the case of Japan, following the election of Shinzo Abe as the Prime Minister, the central bank of Japan engaged in a quantitative easing program in 2012 and doubled its inflation rate. This two pronged attack led to a fall in interest rates and a rise in inflationary expectations. This major policy shift has had strong implications for the labor market, industrial output and foreign investment in Japan. Currency depreciation, due to a fall in interest rate, is believed to have led to an increase in the level of economic activity, causing share prices to increase despite an increase in the dependence ratio. Therefore, in line with Brooks (2006), we argue that the empirical association between share prices and demographic changes does not reflect a causal relationship; rather, it reflects the omission of important variables from the model. Thus it is hardly surprising that academic literature has failed to provide evidence of a strong association between demographic shifts and stock returns. In light of this concern, using monthly data from October 1, 2007 to October 1, 2018, we investigate the effects of changes in the dependence ratio and M3 broad money supply on the mean and variance of stock returns and bond yields in Japan, while controlling for financial crisis, stock returns in USA, unemployment rate, real exchange rate, oil prices, and industrial production. This paper makes a significant advancement over existing empirical studies by comparing the results of four distinct estimation techniques. We apply the post-LASSO OLS, quantile regression, Johansen (1995) cointegration test, and GARCH processes for robustness check. The results, overall, indicate that demographic shifts and monetary easing will have significant effects on asset returns in Japan.

2. Literature Review

Based on the predictions of the OLG model and the life cycle hypothesis, one would expect stock prices to fall with an increase in the dependence ratio. In empirical studies, the significance and direction of impact of changes in population age structure on asset prices will depend on the econometric methodology, the sample period, the sample size and the variables under study. Variations in empirical specification and the fact that asset prices are affected by factors other than just the population age structure, it is hardly surprising that existing literature has failed to provide strong evidence of a direct link between demographic transition and asset returns to support the theoretical predictions of the OLG model and the lifecycle hypothesis.

In studies that have provided evidence of a fall in asset returns when the baby boom generation reaches retirement age, the magnitude of the effects of demographic changes on asset returns is found to be relatively modest. For instance, Poterba (2001) studied the relationship between demographic structure and real returns on Treasury bills, long-term government bonds, and corporate stocks for the United States, Canada and the United Kingdom. Although theory suggests that returns on financial assets will vary according to changes in the age structure, the author reported lack of a robust relationship between the variables in time series data. Although Yoo (1994) finds that a rise in the birth rate followed by a fall in the birth rate, first raises asset returns and then lowers it, the sensitivity of asset returns to demographic changes would depend on the supply of capital in the economy. Brooks (2000) provided simulation evidence on the effects of a baby boom on asset returns. The author found that asset returns fall when the large cohort reaches retirement age. However, the simulation results indicate that the effects of demographic changes on asset returns are rather modest. Brooks (2000) reported lack of a historical link between demographic changes and asset returns. The author found that a positive association between the relative importance of middle-aged cohorts and high asset prices does not hold for countries with strong equity market participation such as Australia, Canada, New Zealand, the United States and the United Kingdom. Bakshi and Chen (1994) found that financial market participants become more risk averse as they grow older, and so "age dependent risk aversion" affects asset returns. The findings are supported by Cohn et al (1975), Morin and Suarez (1983), Storresletten et al. (2007) and Campbell and Viceira (2002). However, in a recent paper, Iwaisako et al. (2016) found that, in the case of Japan, there has been no significant decline in stock holdings and the trend is expected to continue. The authors attribute their findings to the increase in the wealth of the elderly and the increasing proportion of the wealthy elderly in the Japanese population. Bergantino (1998) reported evidence of a statistically significant link between demographic changes and long-run movements in asset prices. Goyal (2004) that there is a positive correlation between stock market outflows and the fraction of old people (65 and above) and a negative correlation between the fraction of the middle aged cohort (45 to 64). In contrast, Ang & Maddaloni (2005) found that the evidence on the link between demographic changes and risk premium is rather weak in case of the United States but strong in case of other developed countries. Demographic coefficients were found to be significant for Japan but with the opposite sign to that of the U.S. coefficient estimates. Abel (2001) tested the asset market meltdown hypothesis, and found that the equilibrium price of assets may still fall even if the demand for assets by the retired baby boomers remains high. Some economists have noted that population ageing in the developed countries will put downward pressure on stock prices; however, those stocks will be purchased by the young investors in the developing countries, and so the asset prices in the developed countries will rise and not fall. Furthermore, the wealthy individuals may not have the necessity to sell shares when they become old, even more so if the companies boost dividends so that they are able to maintain their living standards. Braun et al. (2004) found that demographic changes significantly affect the predictability of excess returns in Japan. Geanakoplos et al. (2004) reported evidence of a significant link between demographic changes and equity prices for France and Japan, but lack of a significant link for Germany and the United Kingdom. Takáts (2010) found that ageing will lower real house prices in the United, Europe and Japan, and the impact is much stronger in case of Europe and Japan compared to the United States.

The lack of a general consensus on the relation between demographic changes and asset returns in existing literature, therefore, motivates us to reinvestigate this issue for the declining Japanese population with the most recent data set.

3. Data Description

3.1 *Data*: This study focuses on the period October 1, 2007 to October 1, 2018 primarily because share prices in Japan increased with an increase in the dependence ratio, contradicting the predictions of the OLG model and the life cycle hypothesis. During this same period, the 10-year long-term government bond yield declined from 1.62% to 0.13%.

Could the decline in long-term government bond yields have been a major contributing factor for the rise in share prices? With demographic transition, long-term government bond yield would have a significant impact on share prices in Japan, mainly due to changes in risk preferences of individuals over time. Firstly, if long-term government bond yields rise, then investors will allocate resources from stocks to bonds. Secondly, if individuals become more risk averse with an increase in age, then a reallocation of resources from stock to bonds will take place. It is plausible to assume that the positive association between share prices and the dependency ratio in Japan reflects the omission of important variables which could possibly have *offset* the effects of demographic transition on share prices. We estimate two models. In the first model, the dependent variable is the total share prices for all shares in Japan. In the second model, the dependent variable is the 10-year long-term government bond yield for Japan. The monthly data are obtained from the Federal Reserve Bank of St. Louis. This section presents a discussion of the variables that may have driven share prices and long-term government bond yields in Japan despite an increase in the dependency ratio during the sample period under study.

3.2 *Estimation Method*: To explore relationships possibly appearing in the conditional mean (first moment), conditional standard deviation (second moment), conditional quantiles, and the long-run relation, we apply four distinct estimation methods, namely, the post-LASSO OLS, quantile regression, Johansen (1995) cointegration test, and GARCH processes. The significant explanatory variables in both the stock returns model and long-term government bond yields are determined by the LASSO method. We then we apply the OLS estimation method. We also perform the cointegration test to examine the short-run and long-run dynamics. The mean stock return and bond yield in OLS is measured by $\log(P_t) - \log(P_{t-1})$. The variance of stock returns in OLS is measured by the conditional standard deviation of the stock return, estimated by GARCH (1, 1). In case of long-term government bond yields, we perform quantile regression at the 5^{th} percentile. The variance of bond yields in OLS is measured by the conditional standard deviation of bond yields, and estimated by ARMA (1,1) – GARCH (1,1). In post-LASSO OLS, we estimate a predictive model of the form

$$Y_t = \beta X_{t-1}^{`} + \varepsilon_t \qquad (1)$$

Y_t represents the mean of stock returns or bond yields at time t; β is the vector of coefficients; X_{t-1} is the vector of explanatory variables; ε_t is the disturbance term. The model in (1) shows the percentage change in stock returns or bond yields at time t due to a change in one of its potential determinants at time $t-1$.

4. Main Results

In order to improve the predictability and interpretability of the statistical models, in the first step, we apply the LASSO method for variable selection on 21 variables with the stock returns as the dependent variable. The penalty value in LASSO estimation was chosen by five-fold cross validation. The significant explanatory variables for the mean of the stock returns model, determined by the LASSO method, are growth in the dependence ratio for the old, square of the growth in the dependence ratio for the young and the old, financial crisis dummy, total share prices for all shares in USA, growth rate in broad (M3) money supply in Japan (percentage change over the previous month), unemployment rate (percentage change over the previous month), square of the unemployment rate (percentage change over the previous month), real exchange rate (percentage change over the previous month), square of the real exchange rate (percentage change over the previous month), oil price index (percentage change over the previous month), square of the industrial production index (percentage change over the previous month), and square of the 10-year long-term government bond yield (percentage change over the previous month). Once the significant explanatory variables are determined by the LASSO method, in the second step, we run the post-LASSO OLS, that is, we regress the stock returns on those selected important variables. Table 1 presents the coefficient estimates.

Table 1. Mean Stock Returns

	Estimate	Standard Error	t-value	Pr > |t|
constant	0.16	0.25	0.64	0.53
dro-growth	1.86	0.47	3.96	0.00***
dep-growth^2	-3.16	0.59	-5.36	0.00***
crisis	-1.98	0.53	-3.72	0.00***
return-f	0.13	0.05	2.52	0.13**
bmj-growth	-2.17	1.09	-1.99	0.05*
unr-change	0.10	0.06	1.54	0.13
rer-change	0.04	0.04	1.13	0.26
opi-change	0.04	0.03	1.41	0.16
rer-change^2	0.04	0.02	1.85	0.07*
ipi-change^2	-0.01	0.002	-5.37	0.00***
unr-change^2	0.01	0.01	0.71	0.48
yield-change^2	0.00001	0.000001	4.73	0.00***

***, ** and * indicate significant at 1%, 5% and 10% significance level, respectively.

In our predictive model, for every 1% increase in the growth of dependence ratio for the old in the current period, mean stock returns in Japan is expected to increase in the next period. For every 1% increase in the square of the growth in the dependence ratio for the young and the old in the current period, mean stock returns is expected to increase in the next period. A financial crisis in the United States in the current period is expected to decrease mean stock returns in the next period. The coefficients are significant at the 1% significance level. For every 1% increase in mean stock returns in the United States in the current period, mean stock returns in Japan is expected to increase in the next period. The coefficient is significant at the 5% significance level. A 1% increase in the growth rate in M3 money supply in Japan in the current period (measured by the percentage change over the previous month) is expected to decrease mean stock returns in Japan in the next period. The coefficient is significant at the 10% significance level. A 1% rise in the square of the real exchange rate in the current period is expected to increase mean stock returns in Japan in the next period. The coefficient is significant at the 10% significance level. A 1% increase in the square of the industrial production index in the current period is expected to decrease mean stock returns in Japan in the next period. A 1% increase in the square of the 10-year long-term Japanese government bond yield in the current period is expected to increase mean stock returns in Japan in the next period. The coefficients are significant at the 1% significance level. Therefore, growth in the dependence ratio for the old, and increases in the mean stock returns in the United States and 10-year long-term government bond yields are expected to increase stock returns in Japan in the next period. But financial crisis in the United States, and growth rate in M3 money supply in Japan (percentage change over the previous month) in the current period are expected to decrease mean stock returns in Japan in the next period. A non-linear relationship is observed between mean stock returns and growth in the dependence ratio for the young and the old, between mean stock returns and industrial production index (percentage change over the previous month), and also between mean stock returns and the 10-year long-term government bond yields.

The volatility in stock returns in Japan is measured by the conditional standard deviation of the stock return, estimated by GARCH (1, 1). We first apply the LASSO method for variable selection on 21 variables with the volatility in stock returns, i.e., the fitted value of GARCH(1,1), as the dependent variable. The penalty value in LASSO estimation was chosen by 5-fold cross validation. Table 2 presents the coefficient estimates from regressing the estimated volatility in stock returns on the LASSO-selected variables.

Table 2. Conditional Deviation of Stock Returns

	Estimate	Standard Error	t-value	Pr > |t|
constant	1.98	0.09	21.92	0.00***
dro-growth	0.01	0.05	0.25	0.81
dep-growth^2	0.10	0.13	0.80	0.43
crisis	0.32	0.09	3.56	0.00***
return-f^2	0.003	0.002	1.56	0.12
bmj-growth	0.07	0.48	0.13	0.89
rer-change	-0.01	0.01	-1.40	0.16
ipi-change	0.001	0.01	0.13	0.89
opi-change	0.001	0.00	0.37	0.71
bmj-change^2	-0.58	1.08	-0.53	0.59
rer-change^2	0.002	0.002	0.95	0.35
unr-change^2	-0.002	0.001	-2.01	0.05*

*** and * indicate significant at 1% and 10% significance level, respectively.

The significant explanatory variables for the variance of mean stock returns are growth in the dependence ratio for the old, square of the growth in the dependence ratio for the young and the old, financial crisis dummy, square of the total share prices for all shares in USA, growth rate in broad (M3) money supply in Japan (percentage change over the previous month), real exchange rate (percentage change over the previous month), industrial production index (percentage change over the previous month), oil price index (percentage change of the previous month), square of the growth rate in broad (M3) money supply in Japan (percentage change over the previous month), square of the real exchange rate (percentage change over the previous month), and square of the unemployment rate (percentage change over the previous month). A financial crisis in the United States in the current period is found to increase the volatility in mean stock returns in Japan in the next period. The coefficient is significant at the 1% significance level. A non-linear relationship is found to exist between the volatility in mean stock returns and unemployment rate in Japan.

In both the OLS and the Quantile Regression models with bond yield as the dependent variable, the significant variables determined by the LASSO method are the growth in the dependence ratio for the old, financial crisis dummy, and growth in the broad (M3) money supply in Japan (percentage change over the previous month). Table 3 presents the coefficient estimates for the OLS model.

Table 3. Mean Bond Yield: OLS Estimates

	Estimate	Standard Error	t-value	Pr > |t|
constant	0.83	0.16	5.09	0.00***
dro-growth	-0.02	0.16	-0.10	0.92
crisis	0.73	0.12	6.21	0.00***
bmj-growth	-1.11	0.39	-2.85	0.01**

*** and ** indicate significant at 1% and 5% significance level, respectively.

Financial crisis in the United States in the current period is expected to increase the mean bond yields in Japan in the next period. The variable is significant at the 1% significance level. A 1% growth in the broad (M3) money supply in Japan in the current period (percentage change over the previous month) is expected to decrease mean bond yields in the next period. The variable is significant at the 5% significance level. The coefficient estimates for the Quantile Regression model at the 5th percentile are presented in Table 4.

Table 4. Bond Yield: Quantile Regression

	Estimate	Standard Error	t-value	Pr > |t|
constant	0.09	0.09	1.00	0.32
dro-growth	-0.05	0.18	-0.27	0.79
crisis	1.23	0.09	13.50	0.00***
bmj-growth	-0.64	0.31	-2.05	0.04**

*** and ** indicate significant at 1% and 5% significance level, respectively.

Financial crisis in the United States in the current period is expected to increase mean bond yields in Japan in the next period. The variable is significant at the 1% significance level. Growth in the broad (M3) money supply in Japan in the current period (percentage change over the previous month) is expected to decrease mean bond yields in Japan in the next period. The variable is significant at the 5% significance level.

The volatility in the 10-year long-term government bond yields in Japan is measured by the conditional standard deviation of bond return, estimated by ARMA (1, 1) - GARCH (1, 1). We first apply the LASSO method for variable selection on 21 variables with the estimated volatility in the 10-year long-term government bond yields as the dependent variable. Table 5 presents the coefficient estimates from regressing the fitted value of ARMA(1,1)-GARCH(1,1) on the LASSO-selected three variables.

Table 5. Bond Yield: Conditional Standard Deviation in OLS

	Estimate	Standard Error	t-value	Pr > |t|
constant	0.09	0.01	6.81	0.00***
dro-growth	-0.01	0.01	-1.23	0.22
crisis	0.04	0.02	2.05	0.04**
bmj-growth	-0.05	0.05	-1.13	0.26

*** and ** indicate significant at 1% and 5% significance level, respectively.

Financial crisis dummy is the only variable that is found to be statistically significant. A financial crisis in the United States in the current period is expected to increase the volatility in mean bond yields in Japan in the next period. The variable is significant at the 5% significance level. The coefficient estimates for the Quantile Regression model at the 5^{th} percentile are presented in Table 6.

Table 6. Bond Yield: Conditional Standard Deviation in Quantile Regression

	Estimate	Standard Error	t-value	Pr > |t|
constant	0.05	0.002	23.85	0.00***
dro-growth	0.01	0.003	2.86	0.00***
crisis	0.02	0.004	5.94	0.00***
bmj-growth	-0.02	0.009	-2.48	0.02**

*** and ** indicate significant at 1% and 5% significance level, respectively.

All three variables are statistically significant. A 1% increase in the dependence ratio for the old in Japan in the current period is expected to increase the volatility in mean bond yields in the next period. The variable is significant at the 1% significance level. Financial crisis in the United States in the current period is expected to increase the volatility in mean bond yields in Japan in the next period. A 1% increase in the growth in broad (M3) money supply in Japan in the current period (percentage change over the previous month) is expected to decrease volatility in mean bond yields in the next period.

In order to examine the existence of a long-run relationship between stock prices and the dependence ratio, the Johansen (1995) cointegration test was performed with five variables, namely, growth in broad (M3) money supply in Japan (% change over the previous month), real exchange rate (% change over the previous month), log of stock prices in Japan, log of stock prices in the United States, and the dependence ratio for the young and the old in Japan. The maximum rank of the cointegrating matrix, $r = 2$; thus two co-integrated vectors are determined. The short-run and the long-run coefficients are presented in Table 7 and Table 8 respectively.

Table 7. Short-Run Dynamics

	Estimate	Standard Error	t-value	Pr > |t|
ect1	-0.01	0.004	-2.22	0.03**
constant	-0.31	0.13	-2.33	0.02**
bmj.d11	-0.06	0.05	-1.25	0.22
rer.d11	0.001	0.004	0.32	0.75
log.spf.d11	0.14	0.20	0.69	0.49
log.spj.d11	0.12	0.20	0.56	0.57
dep.d11	0.06	0.04	1.70	0.09*
bmj.d12	0.05	0.04	1.16	0.25
rer.d12	0.003	0.004	0.75	0.46
log.spf.d12	-0.11	0.19	-0.56	0.58
log.spj.d12	-0.01	0.21	-0.04	0.97
dep.d12	0.07	0.04	1.92	0.06*

** and * indicate significant at 5% and 10% significance level, respectively.

Table 8. Long-Run Dynamics

	Estimate	Standard Error	t-value	Pr > |t|
dep	-0.02	0.02	-1.01	0.32
log(spf)	0.79	0.06	14.46	0.00 ***
bmj	0.01	0.01	0.07	0.48
rer	0.02	0.002	10.38	0.00***

*** indicate significant at 1% significance level.

The short-run adjustment coefficient, ect1, has the expected negative sign. More importantly, it is statistically significant at the 5% significance level, which ensures rapid adjustment toward long-run equilibrium. The short-run coefficient estimates for the dependence ratio for the young and the old, 0.06 and 0.07, are both significantly positive; therefore, the short-run effect of the dependence ratio on stock prices is positive. According to the estimates of the VECM, an increase in the dependence ratio for the young and the old is expected to increase stock prices in Japan, at least in the short-run.

The long-run coefficients are statistically significant for the log of share prices in the United States and the real exchange rate at the 1% significance level. A rise in the exchange rate and an increase in the share prices in the United States in the current period are expected to have positive effects on mean stock prices in Japan in the next period.

5. Conclusion

This paper has estimated a predictive model in order to investigate the effects of changes in stock returns in the United States, financial crisis in the United States, unemployment rate, real exchange rate, oil prices, and industrial production in the current period on the dependency ratio and money supply on asset returns in Japan in the subsequent period. The study has used monthly data for the period starting October 1, 2007 until October 1, 2018, specifically because a rise in the dependency ratio during this period coincided with a rise in share prices in Japan, which contradicts the theoretical predictions of the OLG model and the life cycle hypothesis. The LASSO method selected the dependence ratio as an important variable; however, its effect on mean stock returns and bond yields and on the volatility of stock return and bond yields depends on the estimation method being applied. We estimate a predictive model that investigates how changes in demographics, money supply and other macroeconomic factors in the current period would affect stock returns and bond yields in subsequent periods. Based on the estimates of post-LASSO OLS regressions, vector error correction model, quantile regressions and GARCH process, we conclude that an increase in the dependence ratio will result in an increase in stock returns in Japan. Therefore, population ageing is expected to increase stock returns in Japan in the future. Furthermore, growth in the dependence ratio in the current period is expected to increase the volatility of the 10-year long-term Japanese government bond yields in the next period. A growth in broad (M3) money supply in Japan (% change over the previous month) in the current period is expected to reduce stock returns and bond yields, and also the volatility of their returns in the next period. A financial crisis in the United States in the current period is expected to decrease stock returns but increase long-term government bond yields in Japan in the next period. A financial crisis in the United States in the current period is expected to increase the volatility of both the stock returns and the long-term government bond yields in Japan in the next period.

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