Revealing The Impact Of Demographic Statistics On The Stock Markets Of Developing Countries With Special Reference to India In The 21st Century

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Abstract

The demographic composition, the population age structure of any region or country has an impact on its economy and stock markets. The stock markets performances and its trends reflect the economic position of any region or country.

This paper attempts to study the relationship between demographic variables and financial markets returns of developing countries with special reference to India. It also reveals the impact of demographic statistics on Stock Excess Returns of Bombay Stock Exchange and National Stock Exchange of India in the 21st Century.

The data analysis is done using Linear Regression and inferential techniques reveal a strong and significant impact of demographic statistics on stock markets.

Key Words: Demography, Stock Markets and Linear Regression

INTRODUCTION

The demographic composition, the population age structure of any region or country has an impact on its economy and stock markets. The stock markets performances and its trends reflect the economic position of any region or country. If a region or country is aging, then its citizens are very less or negligible risk takers, they are not the investors but the withdrawers from the stock markets. On the other hand developing countries like India have a demographic dividend. The investors into the stock markets are much higher as compared to the withdrawers or sellers of stock. The positive trend of more investors then sellers has a strong impact on the stock returns of a developing country.

RATIONALE OF STUDY

This paper attempts to study the relationship between demographic variables and financial markets returns of developing countries with special reference to India. It also reveals the impact of demographic statistics on Stock

Excess Returns of Bombay Stock Exchange and National Stock Exchange of India in the 21st Century. Miniscule research has been done where the demographic angle affecting the stock markets has been considered especially with reference to a developing country like India, hence this research is of good significance.

LITERATURE REVIEW

Modigliani and Brumberg (1954) presented one of the first research done, revealing a link between asset prices and different phases of the life cycle model. They developed the life cycle hypothesis which states that a consumer's consumption and saving decisions aim to level consumption during the entire lifespan. The varying developments in asset accrual and portfolio choices over different stages of a person's life cycle lead to an altering demand-supply patterns for assets, these leads to fluctuations in asset prices. In simple terms they, provide a theory explaining the saving and investment behaviour of investors during their life span. According to their theory the productively employed younger individuals tend to save and subsequently invest in real and financial assets over their period of employment. At the early stage of employment most of the saving would be directed towards housing, leading to a rise in real estate prices. At a later stage during the ages of the mid 40's and above, substantial amount of excess saving would be invested in the stock markets. On the contrary, the old age group, as non-savers and sellers of common stock, tend to negatively impact its return. (Modigliani & Brumberg, 1954 (Reproduced 2005)) and (Jokhi & Pandya, 2016)

Morin and Suarez (1983) provide additional empirical evidence to the studies relate to the effect of wealth and investors life cycle on risk aversion. Their study reveals that the phase of the investor's life cycle plays a very important role in the portfolio selection behavior. Also risk aversion increases uniformly with age. Their study investigates the Canadian households demand for risky assets. For this they have used the analysis of covariance techniques. When the sample and wealth parameters are modified in accordance to previous empirical studies, their result on relative risk aversion was upheld and their results supported the existing empirical studies. (Morin & Suarez, 1983) and (Jokhi & Pandya, 2016)

Bakshi and Chen (1994) explored the associations between demographic transition and asset prices. The population under study was the US population, for the time period 1900 to 1990. They have tested the life cycle investment hypothesis and later tested that as the investors age increases, they becomes more risk averse. Their results show that earning people in the 20's and 30's first invest in housing facilities and thereafter as savings accumulate they invest in financial assets. They used average age, along with consumption growth data, to explain stock and T-bill returns and found that average age had a significant effect. Their research clearly revealed that the risk taking behavior of financial investors definitely changes with age and they become more risk averse and prefer less risky assets as they approach retirement. For their statistical testing they use Euler equations as well

as a two-factor model based on consumption growth and percentage change in average age. They thus found robust provisions for their lifecycle risk aversion hypothesis and a statistically strong positive relationship between, the stock excess returns and growth in the average age of the population. (Bakshi & Chen, 1994) and (Jokhi & Pandya, 2016)

Goyal (2004) explores the inter-linkages between various population age structure, net outflows from the stock market and stock market returns. For this study, he uses the Overlapping Generation's Model along with the theory of the Life Cycle Hypothesis. The data analysis is done with the help of multiple regression models, using data related to the populations of mainly USA. The study reveals that stock market outflows are positively correlated with changes in the share of old people (65 and over). It further discloses that there is a negative relation between the changes in the fraction of middle-aged people (45 to 64) and the stock market indicators. Thus this research supports the fact that demographic transitions do have a significant explanatory power over stock market returns. (Goyal, 2004) and (Jokhi & Pandya, 2016)

Chaves D.B. (2012) studies the influence of demographic transition on the economy and financial markets of 30 countries like U.S., Japan, Denmark, Spain, Ireland and China. He has taken into consideration the difference between the share of workers in the population and the share of retirees. Further the influence of the change in this difference on the GDP per capita growth is studies. He has also studied the impact of the difference in the share of population between the potential buyers and sellers on the stock and bond excess returns. In the article he reveals that developing countries are experiencing a great change in their demographic structure and this will impact the economic growth and capital markets in not a very encouraging scenario, if the past trends are considered. (Chaves, 2012) and (Pandya & Jokhi, 2016)

RESEARCH METHODOLOGY

* Research Objectives

1. Study the relationship between demographic variables and financial markets returns.

2. Study the impact of demographic statistics (CNDFA) on Stock Excess Returns of B.S.E. and N.S.E.

*Research Design

This research is both exploratory and descriptive in nature. Initially the various demographic data and stock market data was explored from various dimensions. Based on the data available, various descriptive measures,

correlation analysis, linear regression analysis and inferential techniques were applied and the relationship between the potential investors of the financial markets and stock returns was revealed.

***Data Sources**

The data collected is from secondary sources. Authentic demographic data was collected from genuine websites; Government of India (Open Government Data (OGD) Platform) (Census, 2011) (The Census department of India, 2011) and websites of (United Nations) and (World Bank - World Development Indicators, 2015) were used to get annual data. The stock market related data was also collected through online sources of N.S.E. (NSE India) and B.S.E. (BSE India) official websites , the data was annualised in accordance to the mid-year population.

The data is collected for the time period of 2001- 2014, hence the time span of data analysis is 14 years.

DATA ANALYSIS

Model DTSM

Table 1 Variable Descriptions for Model DTSM

Name	Description
Dependent Variable	
SER	Stock Excess Return for N.S.E. and B.S.E.
Independent Variable	
CNDFA	Change in Net Demand for Financial Assets i.e. (buyers- sellers) = Change in [(40- 59yrs) - (60 & above) / Total Population % share.]

The above model is a part of the Ph.D. thesis (Jokhi, Revealing The Impact Of Demographic Transition On Economic Growth And Stock Market Of India In The Post Liberalisation Era., 2017). For the model under consideration Stock Excess Return (SER) was taken as the dependent variable and CNDFA was considered as the independent variable representing the net potential investors as a demographic proxy. Here CNDFA is the percentage Change in the total population share of the difference between the population of age 40-59 years and 60 years and above. On the lines of (Goyal, 2004, p. 9) the Stock Excess Return (SER) was calculated using the formula:

SER = Ln(1+ Stock Return) – Ln(T-Bills).

Stock return can be calculated with several variations depending on the type and duration of the data available. One of the simplest forms is using yearly closing values available from R.B.I. website or respective stock exchanges official website. Stock return was calculated using the formula, (Closing value of Current year – closing value of previous year) / (Closing value of previous year). The data regarding the Treasury Bills (T. Bills) was taken from the Reserve Bank of India website (Reserve Bank Of India). On the lines of (Chaves, 2012) the Model, which is denoted by DTSM B.S.E. and DTSM N.S.E. representing data from the two major stock markets of India B.S.E. and N.S.E. respectively are:

DTSM B.S.E.

Model for stock market data of B.S.E.

$SERb = \alpha_0 + \alpha_1 CNDFA + \varepsilon$

DTSM N.S.E.

Model for stock market data of N.S.E.

$SERn = \beta_0 + \beta_1 CNDFA + \varepsilon$

EMPIRICAL RESULTS:

Table 2 Descriptive Statistics of Model DTSM B.S.E. and N.S.E.

Variables	Mean	Std. Deviation	Coefficient Of Variation
Stock Excess Return for B.S.E.	0.578	1.857	321.081
Stock Excess Return for N.S.E.	0.558	1.778	318.538
Change in Net Demand for Financial Assets	0.088	0.085	**96.991**

For the above Table 2 it is clearly evident that the most consistent variable for the time period of 2001-2014 i.e. N = 14 years is Change in Net Demand for Financial Assets as its coefficient of variation is the least.

Table 3 Multiple Regression Output for Model DTSM B.S.E. and N.S.E.

Dependent Variable: Stock Excess Return for N.S.E. and B.S.E.		
	Model DTSM B.S.E.	Model DTSM N.S.E.

Independent Variables	Coefficient	p value	Coefficient	p value
Constant	2.166	.000	2.146	.000
CNDFA	-18.124	.000	-18.123	.000
R square	0.687		0.749	
F	26.362		35.889342	
Sig- p value	.000		.000	
Significance at 0.05 level (2-tailed)				

Model DTSM B.S.E. :

Model for stock market data of B.S.E.

SERb= 2.166-18.124CNDFA

In Model DTSM B.S.E. since there is only one dependent variable taken as CNDFA its coefficient is – 18.124. This shows that SERb and CNDFA (buyers – sellers) have an inverse relationship. Hence a unit increase in the independent variable CNDFA decreases the SERb by 18.124. The Coefficient of Determination R^2 which evaluates the overall impact of the independent variable on the dependent variable explain 68.7 % of the total variation, this reflects a strong impact. The p-value of for F-statistic indicates that the bivariate model is significant implying thereby a noticeable impact of demographic variables on Stock market of India. Thus the change in the demographic structure of India in the 21st century has a significant impact on its stock market growth.

In Model DTSM N.S.E.

Model for stock market data of N.S.E.

SERn =2.146-18.123 CNDFA

Here the basic variables remain the same but now instead of BSE data the model considers NSE data. Since there is only one independent variable taken as CNDFA its coefficient is – 18.123. This shows that SERn and CNDFA (buyers – sellers) have an inverse relationship. Hence a unit decrease in the independent variable CNDFA increases the SERn by 18.123. The Coefficient of Determination R^2 which evaluates the overall impact of the independent variable on the dependent variable explain 74.9 % of the total variation, this reflects a strong impact even more than B.S.E. The p-value of for F-statistic indicates that the bivariate model is significant implying

thereby a noticeable impact of demographic variables on Stock market of India. Thus the change in the demographic structure of India in the 21st century has a significant impact on its stock market growth.

Table 4. Overview of the research model DTSM B.S.E. and N.S.E.

Model Code	Dependent Variable	Independent Variables	Highest Contributing Variable	Nature of Relationshin	R^2	p - value Significant at 0.05 level
DTSM BSE	SER	CNDFA	CNDFA	-	0.687	YES
DTSM NSE			CNDFA	-	0.749	YES

The above Table no. 4, clearly reveals the impact of CNDFA on SER through the coefficient of determination R^2 . Thus the impact of CNDFA on B.S.E. and N.S.E. is 68.7% and 74.9% respectively. Hence on an average 71.8 % is the impact of demographic statistics with reference to CNDFA on the stock market returns.

CONCLUSION

On the basis of the above research, the results of Model DTSM B.S.E. and N.S.E indicate that there is an inverse relation between CNDFA and SER with almost same contribution to SER in case of both the stock exchanges. This implies that as the net demand for financial assets increases, in other words, as the number of potential investors (buyers of stocks – sellers of stock) increase, the stock excess returns declines, for both B.S.E. as well as N.S.E.

Thus on the basis of this linear model with special reference to developing country India it is concluded that indeed demographic statistics do have a strong and significant impact on the stock market returns. Hence for any country whether developed or developing, the population's age structure, the demographic structure definitely plays a great role in the development of its country and there by the investments and development of its stock markets. The governments of developing countries must take into consideration the trends of demographic statistics of the country, before making any economic, social or financial policies for the overall development of the economy.

REFERENCES

- (n.d.). Retrieved 2015, from Reserve Bank Of India: https://rbi.org.in

- (n.d.). Retrieved 2016, from BSE India: http://www.bseindia.com
- (n.d.). Retrieved 2016, from NSE India: https://www.nseindia.com
- (n.d.). Retrieved 2016, from Open Government Data (OGD) Platform: https://data.gov.in
- The Census department of India. (2011). *The Age Profile Of Indians (All Ages).* New Delhi: Census Of India.
- (2015). Retrieved from The World Bank: http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators#
- *World Bank - World Development Indicators.* (2015). Retrieved from http://databank.worldbank.org/data.
- Bakshi, G. S., & Chen, Z. (1994). Baby Boom, Population Aging, and Capital Markets. *Journal of Business*, 165-202.
- Census, o. I. (2011). *Profile of Adolescents and youth in India.* New Delhi: Office of the Registrar General and Census Commissioner and UNFPA, India.
- Chaves, D. B. (2012). Can Demographic Transitions Influence the Economy and Financial Markets? *Investment & Wealth Monitor*, pp. 14-18.
- Goyal, A. (2004, March). Demographics,Stock Market Flows,and Stock Returns. *Journal of Financial and Quantitative Analysis, 39*(1), 115-142.
- Jokhi, D. (2017, June). Revealing The Impact Of Demographic Transition On Economic Growth And Stock Market Of India In The Post Liberalisation Era. India: Master thesis submitted to Department of Commerce, Gujarat University,Gujarat.
- Jokhi, D., & Pandya, H. (2016, February). Impact of Demographic Transition on Stock Markets-A Review Perspective. *International Journal Of Innovative Research And Development, 5*(3), 194-196.
- Modigliani, F., & Brumberg, R. (1954 (Reproduced 2005)). Utility analysis and the consumption function: An interpretation of cross section data. In F. Modigliani, *The collected papers of Franco Modigliani* (pp. 3-46). Cambridge: MIT Press.
- Morin, R. A., & Suarez, F. (1983, September). Risk Aversion Revisited. *The Journal of Finance, 38*(4), 1201-1216.
- United Nations, P. D. (n.d.). *World Population Prospects: The 2015 Revision*. (Department of Economic and Social Affairs) Retrieved 2015, from http://esa.un.org/undp/wpp/Excel-Data