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# Tertiary Degrees and the Market: Cross-Country Statistical Evidence

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By

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# INTRODUCTION

Substantial differences in stock market behavior exists across the world. Many determinants have been explored and empirically studied, yet the exact reasons for these differences remain unclear. The purpose of this paper is to contribute some insight into the question of why market behavior differs across countries and between social groups despite continuing globalization within financial markets. I hypothesize that there is a direct relationship between personality and trading behavior that directly affects market liquidity.

To investigate this, I draw upon two publicly available datasets: The World Bank's Global Financial Development Database (GFDD) and Education Statistics (EdStats). I hope to eliminate the issue of small sample size and other limitations experienced by predecessors who have tried to touch upon this subject by using two datasets that contain observations from emerging and developed countries in a more balanced manner.

Building on the current body of empirical works on the topic of market liquidity, I theorize that investors' education level and subject degree choice are among the driving forces behind market behavior. Using this hypothesis, I have found consistent evidence showing that a population's tertiary degree subject choice has a statistically significant relationship with the country's stock market liquidity as proxy by turnover ratio. Specifically, the percentage of population graduating with degrees in social science, business, and law has a negative association with market turnover ratio, while the percentage of the population graduating from liberal arts and STEM degrees has the opposite effect. I interpret these results as supporting the collective notion that investor characteristics play a role in shaping the country's market characteristics.

The remainder of this paper is separated into six sections: literature review, investors' characteristics and the market, data description, model description, results interpretation, and conclusion.

# LITERATURE REVIEW

This section delineates the main studies in this field of economics. I start by explaining the key characteristics of Efficient Market Theory, noise trading, and the concept of portfolio turnover ratio. The model proposed for this thesis draws on many of these theories and thus it is important to understand the critiques and biases of the various studies. I then go on to outline the body of psychology literature on the subject of the determinants of investors' characteristics. Lastly, I draw upon my own conclusion which connects the two distinct bodies of literature as they are both possible alternative explanations behind my model's results. The data used within my study does not allow me to distinguish between the two different schools of thoughts.

## Efficient Market Theory

The efficient market theory states that prices fully reflect all available information. It is most applicable when competition among all participants leads to actual prices of individual securities fully reflecting accurate information from both buyers and sellers. In a system where knowledge of relevant facts is easily distributed and dispersed among many people, price can essentially be seen as the gauge that facilitates the population's action (Hayek, 1945)**.** The population within this market must be large and made up of rational profit maximizers who are actively competing with each other. Everyone in a population is compelled to act within their own self-interest. As a result, the population is contributing all available information to the market as seen reflected in the form of price signals. Given these assumptions, I can infer that the actual price of a security will be a good estimator of its intrinsic value at any point in time within an efficient market (Fama, 1965). Closely associated with the efficient market hypothesis is the

idea of a 'random walk'. Price changes are a random walk if information is immediately reflected in stock prices (Malkiel, 2003). As technology advances and globalization continues, we can expect information to continue to be disseminated, evaluated, and reflected within markets in a timely manner (Chen, Jiang, Liu, & Tu, 2017).

Over the years, a number of empirical studies have been performed on efficient market theory. This body of work was summarized by Fama in 2014, who concluded that his original efficient market theory gave rise to two groups of researchers. Both groups agree that prices reflect some function of expected future returns. Yet the two groups disagree on what drives the volatility observed. Group one, which Fama labeled the efficient market types, believe the market is rational and its variance is the result of changes in investors' risk or willingness to bear risk being reflected in expected future returns. Group two, which Fama labeled the behaviorists, argue that the variance observed in the function of expected future returns is due to irrational price swings from beliefs or sentiments driving demand for risky assets, causing price to diverge from fundamental value for extended periods of time. Currently there is no available empirical evidence that can resolve this issue in a way that convinces both sides (Fama, 2014).

**Noise Traders**

One of the main building blocks of the efficient market hypothesis is the idea that participants are rational, and prices only respond to new fundamental information. Shleifer and Summers (1990) summarized literature that challenged the efficient market hypothesis. These assumptions implied that changes in investor sentiment are not always fully countered by arbitrageurs. Schwert (2003) illustrated empirical anomalies that support Shleifer and Summers' work. This body of literature was recently reviewed by Beer, Watfa, and Zouaoui (2012) who

concluded that asset prices are established through a dynamic interplay between rational ('information') traders and noise traders acting on stochastic sentiment which cannot be perfectly forecasted by rational traders. Subrahmanyam and Titman (2001) showed that volume generated by noise traders stimulates the entry of information traders. Lo (2012) observed that unusual high trading activities can reflect noise trading in the stock market.[1] Therefore, the equilibrium price in this framework is considered to be a reflection of the opinions of rational and noise traders. Asset prices may significantly deviate from fundamental values within this framework if rational investors' arbitrage does not fully offset the effects of sentiment coming from noise traders.

Among various groups of investors, a subset exists who are believed to have psychological biases and are often seen as being associated with noise traders (Park & Kim, 2014). Bender, Osler, and Simon (2013) hypothesized that the human preference for patterns coupled with a strong desire to make money leads some to believe that a correlation exists between historical price patterns and future price movements that do not exist in reality. Another group of researchers believe noise traders to be rational optimizers who are trading to hedge their portfolios or for liquidity reasons (ibid.).

Note that trading based on sentiments and trading for liquidity are not mutually exclusive actions. Some or all of those who are considered noise traders may do both. Together, theories on noise trading and the efficient market hypothesis illustrate reasons why investors trade which affects overall market liquidity.

[1]For a discussion of and critiques on measures of noise trading volume, see Feng, Lin, and Yan (2014).

**Portfolio Turnover & Liquidity**

Liquidity is the degree to which a security or an asset can be purchased without having a significant effect on its price, and as such, it is a central aspect of the stock market. Numerous empirical studies have been performed on its role in asset pricing. An up-and-coming line of research on liquidity concentrates on its effect on the stock market's return which Næs, Skjeltorp, and Ødegaard (2010) theorized to be a compelling indicator for economic growth. Switzer and Picard (2016) showed that various proxies for liquidity act as an indicator for impending economic conditions.

The portfolio turnover ratio is the total value of shares traded during a period as a percentage of total outstanding market value. This flow concept is generally used by participants as one of many measures of liquidity in a particular contract or exchange (Jeanneau & Micu, 2003). This ratio should be considered a more accurate measure of market activity compared to other measures such as the bid-ask spread and volume because it takes into account volume without the effect of holding periods, spreads, or transaction costs which may dictate its movements (Marshall & Young, 2003).

Despite this range of methods, no single statistic is able to illustrate the whole story behind market behavior. Tayeh (2016) showed that all variables used to measure liquidity[2] exhibit variation over time. I chose to focus on turnover ratio as the preferred measure of market liquidity because it is easily quantifiable and clearly defined. Tayeh (2016) cited that turnover ratio is consistent and observable even in situations where liquidity cannot be directly observed, thus, making it an 'intuitive measure of liquidity'. Agnihotri (2015) concluded that portfolio

[2] Tayeh (2016) outlined the different measures of liquidity as turnover, volume, number of trades per day, quoted spread, proportional quoted spread, Roll measure, modified Roll measure, and high-low spread estimator.

turnover ratio is a preferable measure of market activity when compared to other ratios because it is precise. For further analysis and review of literature on the relationship between turnover ratio, liquidity, and market return see Switzer and Picard (2016) who used non-linear models to research the link between liquidity (using various proxies) and business cycles.

**Investors' Characteristics**

A body of literature exists that connects early life environment to economic outcomes. This line of 'postnatal' environment research has made many connections between individual investors' characteristics and how they approach investing later on in life (Cronqvist, Previtero, Siegel, & White, 2016). For example, Malmendier and Nagel (2011) showed that individuals who experienced low stock market returns throughout or in the earlier years of their lives (as seen in the generation that experienced the Great Depression and their offspring or 'Depression babies') are more risk averse and are less likely to participate in the stock market. The same group has also been shown to gravitate more towards value-oriented investing styles (Cronqvist, Siegel, & Yu, 2015). Connecting social psychology and financial decision-making, we can assume that an individual's life choices and/or experiences[3] affect their investment style.

Unlike literature that has focused on individuals' early life development and their resulting financial behavior[4], I aim to draw attention to choices made during their years of tertiary education. I do this by highlighting the relationship between different groups' choice of tertiary degree and market liquidity as proxy by turnover ratio. Choice of tertiary degree subject is the variable used here as proxy to capture certain groups' characteristics or subjects learned.

[3] The country-level data used does not enable me to distinguish between the two.
[4] See Betermier, Calvet, and Sodini (2017); Cesarini, Dawes, Johannesson, Lichtenstein, and Wallace (2009); Cronqvist, Siegel, and Yu (2015); Kaustia and Knüpfer (2008); Malmendier and Nagel (2016).

We cannot ignore the fact that there is no concrete data to show what is really responsible for the effect on turnover ratio: the materials learned in a specific field of study while in college or that certain underlying characteristics determine both the chosen field of study and the group's market behavior.

**Personality and Degree Choice**

In 1959, John L. Holland introduced a theory which suggests that most people resemble a combination of six major personality types. His original theory is now widely known as the Theory of Vocational Choice. The rationale behind his research is rooted in the idea that an optimal 'fit' exists between a student's personality and his or her major. Holland (1959) hypothesized that an individual's occupation level is a function of their intelligence and self-evaluation, which is derived from self-concept. His work has since been investigated empirically by many including Kaufman, Pumaccahua, & Holt (2013); Lievens, Coetsier, De Fruyt, & De Maeseneer (2002); Lounsbury, Smith, Levy, Leong, & Gibson (2009); and Rubinstein (2005). A comprehensive update and review of this body of research has been summarized by Nauta (2010) and systematically summarized by Vedel (2016). While results of the empirical studies on this topic are statistically significant, limitations do exist in the current body of work. One of the challenges in conducting such research is the lack of uniform sampling across all the studies[5]. The second obstacle is how each author and study defines the individual personality traits, which have evolved since Holland's original thesis over fifty years ago.

[5] Some cover a broad spectrum while others choose to narrow their scope (e.g. De Fruyt & Mervielde (1996); Lievens et al. (2002); Lounsbury et al. (2009); Pringle, DuBose, & Yankey (2010)).

As summarized by John, Naumann, and Soto (2008) in Chapter 4 of the *Handbook of Personality*, the Big Five basic dimensions of personality traits are the modern interpretation of distinct common descriptors of personality grouped together using factor analysis. Extraversion is used to describe those who gain energy and creativity from external activities and means. They are talkative, energetic, and assertive. Agreeableness is used to describe individuals who value getting along with others, and who generally have an optimistic view of human nature. This group is sympathetic and affectionate. Conscientiousness is used to describe people with high levels of self-discipline who possess high organizational skills. Neuroticism refers to emotional instability and is interlinked with low tolerance for stress. Lastly, openness describes people who are intellectually curious and are more likely to hold unconventional beliefs.

Porter and Umbach (2006) showed that personality is a consistent predictor of tertiary major choice. Vedel (2016) concluded that consistent personality differences are presented across academic majors. Based on 12 independent studies (Clariana (2013); De Fruyt and Mervielde (1996); Kaufman, Pumaccahua, & Holt (2013); Kline and Lapham (1992); Larsen, Wei, Wu, Borgen, & Bailey (2007); Lievens, Coetsier, De Fruyt, & De Maeseneer (2002); Lounsbury, Smith, Levy, Leong, & Gibson (2009); Marrs, Barb, & Ruggiero (2007); Pringle, DuBose, & Yankey (2010); Rubinstein (2005); Sánchez-Ruiz, Hernández-Torrano, Péréz-González, Batey, & Petrides (2011); and Vedel, Thomsen, & Larsen (2015)), liberal arts and humanities students scored high on neuroticism and openness but low on conscientiousness. Students of STEM (science, technology, engineering, and math) programs scored high on agreeableness. Students of social science and law scored high on extraversion and low on agreeableness (Vedel, 2016). While results have been consistent, there are exceptions such as Larsen et al. (2007) who found no significant difference in personality across different degrees.

Concurrently, Marrs et al. (2007) and Sánchez-Ruiz et al. (2011) found significant differences in openness alone.

**Locus of Control**

If, as outlined by Vedel (2016), such a large difference in personality exists between people with different degree types, I can further draw a connection to Julian Rotter's Locus of Control theory. Rotter believed that personality is a representation of an individual's interaction with his or her environment. The idea refers to the degree to which an individual believes or feels that they have control over the outcome of their own life events (Gore & Rotter, 1963). To be internal means to strongly believe that events are controlled by one's own action. To be external is to be on the opposite spectrum of this belief.

Taylor and Popma (1990) showed that a negative relationship exists between locus of control and a person's confidence level in decision making. This indicates that the more a person believes that they have control over their own life event outcomes, the more confidence they express in career making decisions and task performance. Martin, Thomas, Charles, Epitropaki, & McNamara (2005) theorized that since internal individuals use more adaptive coping strategies, they are more pro-active in handling stressful situations. Individuals who identify as being internal are less likely to experience high levels of stress while external individuals are more vulnerable to stress (Kalbers & Fogarty, 2005). Rahim (1996) and Miličič et al. (2016) showed that those who are considered internal do not have a hard time coping with stress when compared to those who fall into the external category. For more background and detail on locus of control see Angelova (2016) and Rogers (2015).

Jemi-Alade (2008) surveyed 88 college seniors and graduate students in business administration programs at two universities in southeastern Texas and reported that 52.1% of the

students sampled identify as internal and 44.2% of the same group identify as external. Napowanetz (2014) found no significant differences between students of STEM compared to non-STEM majors and a more dominant locus of control orientation. However, her study faced a similar limitation of sample size (n = 100) and had a bias due to uneven distribution of major distribution[6]. Naik (2015) also found no significant differences in locus of control between arts and science students. Naik's study was conducted using data from 171 students from thirty-five different colleges with an approximately balanced sample between science and arts students. As noted by Naik (2015), there is a current lack of research on locus of control and academic majors. One common hurdle I found in the current body of literature lies in the lack of a large (where n > 356), uniform, clearly defined, and balanced dataset containing individual level data on both locus of control and tertiary degree choice. I believe it is still possible that different groups of people with different tertiary degree subject types could be found to be on the opposite end of the locus of control spectrum.

Salamanca, de Grip, Fouarge, and Montizaan (2016) used the Dutch National Bank Household Survey (DHS) to illustrate that household heads with a strong internal 'economic locus of control' are more likely to hold equity and/or possess a larger share of equity in their investment portfolio. It was also argued in the same paper that this relationship is the result of people with an internal locus of control having a lower perception of risk when investing in equities. However, current results from studies relating locus of control to investment decision-making are inconsistent. Maital, Filer, and Simon (1986) showed that internal individuals are more likely to undertake risk. However, their results were drawn from an original game simulation conducted on eighty-seven undergraduate students enrolled in a corporate finance

[6] Students surveyed were registered in the Fundamentals of Psychology course offered on campus.

class at a university in the United States. McInish (1980) confirmed this result by replicating Maital et al. (1986) using eighty-three senior undergraduate business majors, and later showed that there is a slight tendency for high external individuals to hold more risky stocks based on a survey of 267 actual investors (McInish, 1982). However, the relationship shown by McInish (1982) is not strong and the result should be considered uncertain. Chui (2001) conducted a similar game simulation as Maital et al. (1986) and McInish (1980) on forty-seven senior undergraduate business students in Macau and showed that people who are considered to be internal displayed the highest degree of loss aversion compared with those who are considered to be external on the locus of control scale. While the disposition effect (tendency to sell winning assets too soon and hold losing assets for too long) in Chui (2001) is weaker for the external than the internal group, data do not indicate that trading volume is subject to locus of control.

When comparing different studies on locus of control we must keep in mind that a generational shift on the average score of the locus of control scale have been observed over time. Noted by McInish (1982) and summarized by Strickland (2017), the average college student in 2002 identified as being more external than eighty percent of college students in 1960. This may be the result of rapid social changes that have taken place in the last fifty years, such as the civil rights movement and multiple wars.

Following Vedel's conclusion and the discussion of locus of control, we can deduce that people choose their tertiary degree based on their personality and suggest a relationship may exist between each group and a particular trading style/investing strategy. The next part of the paper aims to explore this connection.

## INVESTORS' CHARACTERISTICS AND THE MARKET

As financial borders between developing and developed markets have begun to disappear in the face of globalization (see Broner and Ventura (2016); Doman and Doman (2013); Esqueda, Assefa, and Mollick (2012); Kandil, Shahbaz, and Nasreen (2015); Lehkonen (2015)), I am curious about the specific characteristics of different groups of investors. To answer the question of what differentiates groups of investors besides their surrounding macroeconomic factors, I used current publicly available data and focused on the population's choice of tertiary degree subject, due to the existing body of research surrounding the theory of vocational choice and locus of control. Keeping in mind that I am unable to distinguish between the type of individual and what they learned within the available dataset, I hypothesize that individuals with liberal arts and STEM degrees are likely to trade more often compared to those with a degree in social science, business, and law. This may be due to differences in understanding of market forces and structures or due to personality. I cannot separate personality differences and subjects learned using the available country-level data, and so am merely suggesting that the two theories be used as alternative explanations of my results. A possibility still exists that even if degree subject were randomly assigned (such as within a command economy), those who were taught efficient market theory would still be more likely follow a 'buy and hold' strategy regardless of their inherent personality type or risk appetite.

Is it possible for certain groups of individuals to be more willing to make investment decisions based on other factors besides fundamental information? If so, this group is inadvertently falling into noise trading-like behavior. As discussed earlier, noise traders may choose to trade for reasons other than those based on fundamental information such as to meet

personal liquidity constraints or to hedge for unforeseen risk. Noise trading behaviors are essential in facilitating executions for traders with 'real' information (i.e. those who are trading based on pure fundamental information). Without noise traders, those who are looking to enter into trades based purely on fundamentals would be reluctant to trade with one another because both parties would know that the other holds a special piece of information and would not hurry to trade (Bernstein, 1987). The existence of noise traders therefore supports long term market equilibrium. Combining this idea with the theory on locus of control and Holland's theory of vocational choice (1959) while drawing upon the available data for choice of tertiary degree subject type at the country level, we are able to further explore the possibility of suggesting which group may be willing to trade more often than others as noted earlier by Lo (2012).

Using tertiary degree subject choice as a quantifiable substitution for measures of personality permits us to explain why individuals with STEM or liberal arts degrees have a completely different effect on stock market liquidity than individuals with a degree in social science. For example, students of liberal arts degrees are theorized to be more external individuals (Vedel, 2016). They are described as a group of people who are intellectually curious with low levels of self-discipline and low tolerance for stress. This lack of appetite for stress and low level of self-discipline could be the driving force behind this group's motivation to behave more like noise traders than information traders. The population group acting as noise traders may be exhibiting herd behaviors or are less likely to stomach the variance in short-term marked to market pricing – an experience that is closely associated with holding onto an asset in the long term. My analysis overall does not take into account the possibility that stress aversion may keep certain groups out of the equity market completely. At the opposite end of the spectrum, the population group with social science, business, and law degrees are theorized by the same body

of research summarized by Vedel to be more assertive and competitive (scoring high on extraversion and low on agreeableness). The higher degree of confidence found in being assertive coupled with the drive for competition may cause this group to ignore noise and focus on what they know as facts. Those in this category are also more likely to have a formal educational background in market forces and theories compared to students of STEM and liberal arts degrees. We infer that students of social science, business, and law degrees have been taught efficient market theory and as a result understand that it is impossible to beat the market in the long term while students with other degree types may be unaware of this theory. Students who understand the theory may be more likely to hold onto an asset for a longer period of time regardless of whether the securities hold more perceived beta risk, because they are confident enough in their research of fundamentals. They may also be able to recognize and handle short term volatility in marked to market pricing.

## DATA

The World Bank's Global Financial Development Database (GFDD) contains an extensive collection of various characteristics of cross-country financial systems and markets. This dynamic dataset includes measures ranging from the efficiency, stability, size, and depth of various financial institutions and markets to the country's degree of individual accessibility to its market and financial instruments. This dataset spans from 1960 through 2014 and is updated annually. It was originally compiled in 2012 with the goal of improving empirical research on different characteristics of financial systems across countries and regions and their effect on economic development. Prior to the compilation of this dataset, researchers did not have a reliable and publicly available cross-country panel dataset with different measures within various financial systems (Čihák, Demirgüç-Kunt, Feyen, & Levine, 2012). This work was prepared as part of a larger collective effort by the World Bank to provide open access to its research and to encourage further development policy discussions among researchers.

Along with the aforementioned database, the World Bank also published a second database with 4,000 standardized indicators for education ranging from access, progress, and assessments to expenditures. The Education Statistics (EdStats) dataset covers the whole education cycle from pre-primary to vocational and post graduate education. This dataset covers 214 countries from 1970 through present day and is updated on a quarterly basis.

The final dataset used here is a combination of the two databases described above. My cleaned and combined dataset covers 55 countries between the years 1995 through 2011. Data for the years prior to 1995 and post 2011 have been omitted due to incomplete information. Additional countries with incomplete education and or market observations have also been

excluded. By using two standardized and dynamic datasets with open access, I aim to fill in the gap prevalent in the prior empirical body of work. My dataset contains details and data on both emerging and developed countries in an approximately balanced manner. Most importantly, the standardization of annual data points detailed by the World Bank made it incredibly easy to visualize data and interpret results.

While much of the discussion to date has focused on individual investors' behavior, the dataset used here is at the national level because it was open source and standardized by the World Bank. Nationally aggregated data similarly gives what should be considered the weighted average of each country's observation for a particular variable being observed. This is suitable for my hypothesis because it allows me to draw conclusions on different groups based on the group's average behavior observed across multiple countries. Country-level data also ensures that results would not be skewed due to uncontrolled exogenous forces, which is a risk that we would face if we were to use an individual-level dataset on a particular region such as political climate, effects from natural disasters, and socioeconomic status.

## MODEL

While univariate regressions provide us with explanatory powers of individual independent variables, they are limited due to their omission of possible effects from other factors. To examine the relationship between market turnover ratio and education variables while simultaneously controlling for the effects of other factors, I am utilizing a multivariate OLS regression. My model is as follows[7][8][9]:

$$
\begin{aligned}
&Stock\ Market\ Turn\ Over\ Ratio_t \\
&= \beta_0 + \beta_1 Stock\ Market\ Volatility_t + \beta_2 Unemployment\ \%_t \\
&+ \beta_3 \%\ of\ Foreign\ Banks\ among\ Total\ Banks_t \\
&+ \beta_4 Stock\ Market\ Capitalization\ as\ a\ \%\ of\ GDP_t + \beta_5 Banking\ Crisis_t \\
&+ \beta_6 GDP\ per\ Capita_t + \beta_7 \%\ of\ Population\ Graduating\ with\ Liberal\ Arts\ Degree_{t-x} \\
&+ \beta_8 \%\ of\ Population\ Graduating\ with\ STEM\ Degree_{t-x} \\
&+ \beta_9 \%\ of\ Population\ Graduating\ with\ Social\ Science/Business/Law\ Degree_{t-x}
\end{aligned}
$$

The dependent variable is stock market turnover ratio at time $t$. This is used as the measure of choice for liquidity. Education variables used in the model are percentage of population graduating with various degrees at time $t - x$. The $x$ is used above to denote different numbers of years by which the variables are being lagged. I chose to lag education variables for two reasons. Firstly I hope this will help with the issue of endogeneity from omitted variables. This is an issue because I do not have access to individual level data in this dataset to control for

[7] Regression is robust to control for outliers.
[8] Standard errors are clustered by country.
[9] Countries with perfect correlation between education statistics and the dependent variable have been excluded from the group. This 'perfect correlation' occurred due to some countries possessing only one year's worth of observations.

other variables that may influence a group's choice of whether or not to invest in the stock market (such as wealth). Secondly I am interested in the after-effect that tertiary degree choice has on the market. What was learned this year may not be implemented and showing results until some years later. Additionally, I hypothesize the coefficient for education variables within liberal arts and STEM degrees to be positive, and negative for the group with social science, business, and law degrees. Education variables used in this model were generated specifically to avoid multicollinearity, and are the product of the following variables present in EdStats[10]:

$$(\%\ of\ Population\ Enrolled\ in\ College_t) \times (\%\ of\ Population\ Enrolled\ in\ Degree\ Y_t)$$
$$\times (\%\ of\ Graduates\ Graduating\ from\ Degree\ Y_t)$$

Other variables included in the model are used to control for macroeconomic factors that may affect the dependent variable. Stock market volatility is the standardized measure of each country's degree of variation in trading price over the course of time as measured by the standard deviation of logarithmic returns. The number generated by the World Bank uses the average of the 360-day volatility of the national stock market index. I am expecting the coefficient for this variable to be positive due to the univariate relationship illustrated in Graph 1. The positive relationship may theoretically be the result of noise traders entering into the market and driving up liquidity during volatile times. However, Amiram, Cserna, and Levy (2016) have showed that different aspects of volatility have different effects on liquidity. Since I cannot break down volatility into a more granular fashion I will take the ratio as is and accept that it a determinant of liquidity (Amiram, Cserna, & Levy, 2016). Size of the stock market as a percentage of GDP is

[10] $Y$ is used to denote specific degree being generated: liberal arts and STEM, or social science, business, and law.

calculated as the weighted average of the total market capitalization of the country's stock market over the country's overall GDP for the year. I am also expecting this coefficient to be positive, assuming that growth in total market capitalization is the result of a rise in stock price which will also cause the numerator in turnover ratio (volume × price) to increase. Additionally, Nguyen, Duong, and Singh (2016) documented a positive relationship between firm value and stock liquidity. A binary variable representing banking crises was generated by the World Bank with '0' meaning no banking crises existed that year and '1' meaning a banking crises occurred within that year. A banking crisis is defined as systemic and transpires when significant signs of financial distress occur and policy intervention takes place. The first year of this occurrence is considered as a year with a banking crisis ('1' in the dataset). The crisis is considered over the year before real GDP and credit growth rate is positive for at least two consecutive fiscal quarters. I expect the coefficient for banking crises to be positive due to herding behaviors coupled with noise trading during times of uncertainty which then allow information traders to enter into the market as shown by Subrahmanyam and Titman (2001). The three financial indicators are incorporated into the model to control for the size and health of the country's financial markets.

Additionally, percentage of foreign banks among total banks in the country is calculated by the World Bank with the number of foreign owned banks in each country divided by the total number of banks in each country. A bank is considered to be foreign owned if 50% or more of its shares are owned by foreigners. This measure is used as a proxy in the model to control for the openness of the country's financial markets. I believe the coefficient for this variable should also be positive because the more 'open' the market, the more shares are being traded by domestic and international investors.

Unemployment rates within the dataset are the percentage of total labor force that is able and willing to work and currently seeking employment. It is calculated by the World Bank in the dataset using the weighted average of rates within the specific year for each country. I assume the coefficient for this variable will be negative due to the negative economic effects that come with a country having a high unemployment rate. GDP per capita is measured here in constant 2005 US dollar for easy comparison between different countries. GDP is the sum of gross value added by all resident producers in the country including any production taxes and excluding subsidies not included in the value of the products and any depreciation. GDP per capita is consequently the country's weighted average gross domestic product within the specific year dividend by midyear population. I am expecting the coefficient for GDP per capita to be positive due to the positive correlation[11] between that variable and stock market turnover ratio. This is because I am expecting the value of total market capitalization to grow as GDP grows as well as a result of a rise in stock price while shares outstanding stays constant. The two variables are used in the model as proxy to control for the country's overall macroeconomic health and development level.

[11] The correlation between GDP per capita and equity turnover ratio generated from the combined dataset is 0.277.

## RESULTS

Xing (2004) showed that the average investors' education level is a factor in explaining cross-country market differences. My original thesis was that not only does education level matter but the choice of degree is also of relevance. End results are consistent with the hypothesis that a relationship exists between a group of investors' degree choice and market liquidity. The controlled variables behaved as expected.

Lagging the education variables from one to three years, we see consistent results with higher percentage of the population graduating with degrees in social science, business, or law in a given year having statistically significant and negative effects on market liquidity. For every 100 basis points (bps) increase in population graduating with degrees in social science, business, or law, according to this empirical test, market turnover will decrease by approximately 25 bps. The negative coefficient exhibited by this independent variable is not surprising given the earlier discussion on personality and education choice.

We also see consistent results with positive coefficients among the other two non-social science degrees. While percentage of population graduating with liberal arts degrees' regression coefficients were statistically significant with only the one-year lag, the subpopulation graduating with STEM degrees was statistically significant with a three through ten years lag. Regression coefficients for both variables were steadily positive throughout all nine lagged time periods. This is also consistent with the earlier discussion on personality, education choice, and market liquidity. See Table 1 for more detail.

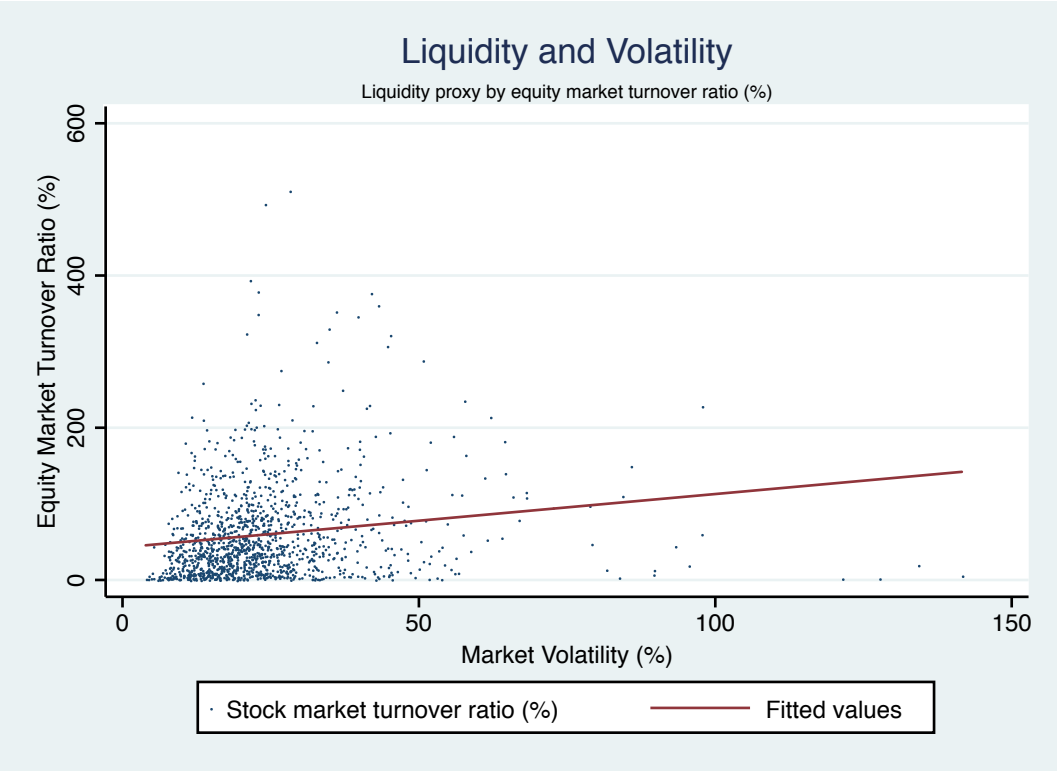
It is not surprising to find statistically significant effects on the independent education variables tested. What is interesting is the negative and statistically significant coefficients for

the percentage of population graduating with degrees in social science, business, and law. Could it be that this specific group better understands how to maximize returns in an efficient market due to their educational background? Or is it because, personality-wise, they are willing to take more risk (exhibited by longer term investing periods) for more reward when compared to the group with liberal arts and STEM degrees?

# CONCLUSION

Using an inclusive and publicly available dataset, I have found statistically significant coefficients that are consistent with my original hypothesis that as a group, investors' degree choice is correlated with the country's stock market liquidity. While previous studies have linked investors' behaviors and characteristics to the stock market, I chose to focus specifically on its effects on market liquidity as proxy by turnover ratio. Choosing to split the population into groups by tertiary degree subject choice has led me to further hypothesize that there is a relationship between these groups and their effect on market liquidity. I have also found consistent evidence of this hypothesis, which leads me to conclude that either personality or exposure to the idea of the efficient market theorem contributes negatively to the country's overall stock market liquidity.

**Graph 1**




Equity turnover ratio (Y axis) is calculated as the weighted average of the value of domestic shares traded dividend by their market capitalization. The data covers measures of market size and liquidity. This data was sourced by the World Bank from Standard & Poor's until April 2013. Data from 2013 onwards has been sourced by the World Bank from the World Federation of Exchanges. The value is annualized by multiplying the monthly average by 12 in the following formula:

$$\left(\frac{Monthly\ electronic\ order\ book\ (EOB) domestic\ shares\ traded}{Month-end\ domestic\ market\ capitalization}\right)\times 12$$

Market volatility (X axis) is the average of the 360-day volatility of the national stock market index.

**Table 1**

Effect of Different Lagged Education Variables on Stock Market Turnover Ratio

| VARIABLES | (1) Education variables lagged by 1 year | (2) Education variables lagged by 2 years | (3) Education variables lagged by 3 years |
|---|---|---|---|
| Stock price volatility | 0.260 | 0.0584 | 0.0531 |
| | (0.533) | (0.412) | (0.375) |
| Unemployment, total (% of total labor force) (modeled ILO estimate) | -0.564 | -0.903 | -0.804 |
| | (1.214) | (1.163) | (1.085) |
| Foreign banks among total banks (%) | -0.578* | -0.557* | -0.493 |
| | (0.310) | (0.314) | (0.317) |
| Stock market capitalization to GDP (%) | 0.134* | 0.140** | 0.156*** |
| | (0.0724) | (0.0574) | (0.0500) |
| Banking crisis dummy (1=banking crisis, 0=none) | 1.746 | 3.585 | 1.569 |
| | (11.94) | (11.08) | (11.37) |
| GDP per capita (constant 2005 US$) | 0.000676 | 0.000593 | 0.000708 |
| | (0.000520) | (0.000522) | (0.000477) |
| Percent of population graduating with degrees in liberal arts | 8,353* | 6,480 | 4,686 |
| | (4,783) | (4,010) | (4,107) |
| Percent of population graduating with degrees in STEM | 4,008 | 4,853 | 5,032* |
| | (3,462) | (3,215) | (2,970) |
| Percent of population graduating with degrees in social science, business, and law | -2,512** | -2,589** | -2,491** |
| | (1,166) | (1,152) | (1,232) |
| Constant | 31.97 | 40.18* | 37.16* |
| | (22.25) | (21.97) | (21.07) |
| Observations | 393 | 364 | 329 |
| R-squared | 0.410 | 0.446 | 0.469 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Robust multivariate OLS regression model. Standard errors are clustered by individual country. Education variables have been generated using data from the World Bank's EdStats to avoid multicollinearity and lagged to avoid the problem of endogeneity.

**Table 1 (cont.)**

Effect of Different Lagged Education Variables on Stock Market Turnover Ratio

| VARIABLES | (1) Education variables lagged by 4 years | (2) Education variables lagged by 5 years | (3) Education variables lagged by 6 years |
|---|---|---|---|
| Stock price volatility | 0.0686 | 0.0420 | 0.0577 |
| | (0.322) | (0.308) | (0.293) |
| Unemployment, total (% of total labor force) (modeled ILO estimate) | -0.774 | -0.587 | -0.735 |
| | (1.007) | (0.733) | (0.744) |
| Foreign banks among total banks (%) | -0.413 | -0.402 | -0.348 |
| | (0.341) | (0.333) | (0.336) |
| Stock market capitalization to GDP (%) | 0.169*** | 0.201*** | 0.232*** |
| | (0.0517) | (0.0542) | (0.0685) |
| Banking crisis dummy (1=banking crisis, 0=none) | 2.986 | 6.482 | 7.925 |
| | (12.35) | (12.55) | (13.47) |
| GDP per capita (constant 2005 US$) | 0.000920* | 0.000917** | 0.000913** |
| | (0.000482) | (0.000447) | (0.000430) |
| Percent of population graduating with degrees in liberal arts | 3,864 | 3,605 | 2,296 |
| | (4,505) | (4,771) | (4,882) |
| Percent of population graduating with degrees in STEM | 4,774* | 4,527** | 4,743** |
| | (2,539) | (2,184) | (2,173) |
| Percent of population graduating with degrees in social science, business, and law | -2,366 | -2,582 | -2,424 |
| | (1,436) | (1,563) | (1,796) |
| Constant | 32.07 | 32.97 | 30.77 |
| | (24.27) | (25.74) | (26.21) |
| Observations | 289 | 252 | 219 |
| R-squared | 0.495 | 0.519 | 0.530 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Robust multivariate OLS regression model. Standard errors are clustered by individual country. Education variables have been generated using data from the World Bank's EdStats to avoid multicollinearity and lagged to avoid the problem of endogeneity.

**Table 1 (cont.)**

Effect of Different Lagged Education Variables on Stock Market Turnover Ratio

| VARIABLES | (1) Education variables lagged by 7 years | (2) Education variables lagged by 8 years | (3) Education variables lagged by 9 years |
|---|---|---|---|
| Stock price volatility | 0.394 | 0.672 | 0.994* |
| | (0.431) | (0.510) | (0.513) |
| Unemployment, total (% of total labor force) (modeled ILO estimate) | -0.491 | -0.327 | -0.442 |
| | (0.781) | (0.771) | (0.778) |
| Foreign banks among total banks (%) | -0.402 | -0.472 | -0.462 |
| | (0.334) | (0.343) | (0.345) |
| Stock market capitalization to GDP (%) | 0.251** | 0.292** | 0.246 |
| | (0.0944) | (0.129) | (0.224) |
| Banking crisis dummy (1=banking crisis, 0=none) | -0.547 | -4.512 | 1.329 |
| | (13.25) | (13.75) | (16.29) |
| GDP per capita (constant 2005 US$) | 0.000956** | 0.000817 | 0.000651 |
| | (0.000462) | (0.000509) | (0.000612) |
| Percent of population graduating with degrees in liberal arts | 1,754 | 2,405 | 3,917 |
| | (5,408) | (5,604) | (5,275) |
| Percent of population graduating with degrees in STEM | 4,740** | 4,527* | 4,916** |
| | (2,319) | (2,330) | (2,411) |
| Percent of population graduating with degrees in social science, business, and law | -1,377 | -405.2 | -668.3 |
| | (2,002) | (2,485) | (2,704) |
| Constant | 19.91 | 10.95 | -0.267 |
| | (29.38) | (32.36) | (34.63) |
| Observations | 187 | 156 | 123 |
| R-squared | 0.525 | 0.527 | 0.541 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Robust multivariate OLS regression model. Standard errors are clustered by individual country. Education variables have been generated using data from the World Bank's EdStats to avoid multicollinearity and lagged to avoid the problem of endogeneity.

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