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SCHOOL OF ECONOMICS AND MANAGEMENT

The Stock market and Human development

A regression analysis of Stock markets indicator on Human development index

by

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Abstract:

Stock market development and its relationship with economic growth has been proven to be significant in previous research but how does it relate to human development? The Human Development Index was first released with the 1990 Human Development Report. If stock market development could impact economic growth could it also impact human development? To analyse the relationship a regression model was made with panel data. To measure stock market development previously established indicators were used and for human development. A significant relationship was not found but could not be ruled out either. Further research is necessary to understand this relationship.

Keywords: Stock Market, Regression analysis, Human development index, panel data

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1 INTRODUCTION

Financial markets could be seen as a place where lenders and borrowers meet to efficiently allocate funds. In theory the excess funds of the lender could be used more efficiently if it was placed in the hands of the borrower and the lender then expects to receive a higher return on the investment than if the money were simply in a bank account or another form of storage. This should in theory make for a more efficient market where funds are allocated to where they are needed. The impact financial markets such as stock markets have on economic growth has been studied and found to be significant, an example being Levine (1991) who found a significant relationship between stock market liquidity and economic growth. However the aim of this thesis is to examine the relationship between stock market development and human development

Economic growth is a part of human development because economic growth will increase opportunity for people, but it is not all there is to it. Level of education and to live a long fulfilling life are also aspects which take great part in the issue of human development. The concept of human development is to create an alternative people-based approach when discussing development instead of making the assumption that economic growth will single-handedly lead to improvements in the day-to-day life of average citizens. To measure human development is not as clear cut as economic growth though. Typically economic growth is measured as of Gross Domestic Product (GDP) per capita but to measure human development an index was created called the Human Development Index (HDI) (Stanton, 2007).

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1.1 The Human Development Index

The first Human Development Report (HDR) which also contained the first showing of the Human Development Index) was published in 1990 issued by the United Nations Development Programme (UNDP). Pakistani economist Mahbub ul Haq was in large part responsible for the development of the index influenced by the previous works of Indian economist Amartya Sen who also was a consultant in the publication of the report. Countries are scored between 0 and 1 where a 1 would be the best result and take three factors into account: life expectancy, knowledge and standard of living (Stanton, 2007).

The HDI score a country receives is based on three different factors which have been made into three separate indexes: the life expectancy index, the education index and the income index. The HDI was created as an alternative view on development where the progress of people and their increase in choice were highlighted to focus on human development. The index is used by the United Nations to measure progress as an alternative to simply consider economic growth. In the case of human development economic growth is a part of it but with the difference of economic growth not being the ultimate goal rather with it being a tool to achieve human development, a means to an end (Haq, 1990).

In 2010 there were changes in how the index was calculated with changes in each of the separate indexes and also using a geometric mean for the three instead of a simple mean. The main workings of the HDI stayed the same with similar scores being kept (Kovacevic and Calderon, 2015). The changes that took place and how to calculate the HDI will be further elaborated in the Data-section.

One of the creators of HDI, Amartya Sen stated "But it can be scarcely denied that economic growth is one aspect of the process of economic development" (Sen, 1983, page 749). The relationship between stock market development and economic growth has been studied and it has been found to be significant. With the quote of Amartya Sen in mind another question arises: Is there a significant relationship between stock market developments and human development?

1.2 Stock Market Development

The characteristics of the relationship between economic growth and stock market development has been proven to be significant and positive, they grow together (Levine and Zervos 1998). With the view of Amartya Sen that economic growth is a part of economic development and therefore human development this study wants to investigate the direct relationship between stock market development and human development. To measure stock market development two characteristics are measured: the size of the stock market and its

liquidity. The reason for this being that's how it has previously been estimated in the academic literature which will be further explained in the data section.

Stock markets have become a big part of modern-day finance and a common reference point for the state of the economy which makes it important to analyse. Before the Corona-virus became a global pandemic in early 2020 stock markets were booming, something USA president Donald Trump took great pride in. Donald Trump's special interest in the going of stock markets as the president might not seem unexpected but it raises the question as to how it can affect the population he oversees and how it affects its development.

1.3 Purpose

The purpose of this thesis is to analyse the relationship between stock market development and human development with empirical methods. Building on previous research on the relationship between economic growth and stock market development because of the inherent role that economic growth plays in human development. To study this relationship data has been collected from 59 countries which were selected based on the availability of the data needed.

2. LITERATURE REVIEW

In some of the early research, Levine (1991) argues that stock market liquidity is important for economic growth. The paper focuses on a hypothetical endogenous growth model which links financial development and steady state growth rate per capita output. From this model a stock market emerges as a way of allocating risks and he further investigates how this can shift or alter investment incentives. He concludes that the stock market is helping agents and firms to manage liquidity risks, meaning that the stock market should have a positive effect on economic growth.

Spears (1991) also investigates how financial intermediation (liquidity) affects economic growth and found that it encourages more investments and affects the allocation of capital. She also concludes that this makes financial intermediation an indirect source of power for economic growth. Simply put, investors sometimes directly avoid companies based on the fact that they cannot withdraw their investment as they see fit. Hence, through financial markets, the withdrawal of money gets easier and their investments tend to be more independent. This ties in well with the findings of Levine (1991) that stock market liquidity is important to economic growth.

In Levine and Zervos (1996) they continue to investigate the relationship between stock markets and long run economic growth. They find that while stock market development has an effect on economic growth, it is still only a fraction of how the banking system affects economic growth. However, these findings are not supposed to devalue the effects of the stock market but rather to showcase the importance of a banking system towards economic growth. The paper also found that the stock market was not significantly affecting all of the studied countries. While they found it to be the case in France, Germany and Japan, they could not find any link between financial development and economic growth rates in the United states and United Kingdom. The paper is however not supposed to be seen as any definite conclusion but rather as an extension to further research on the matter.

Levine and Zervos (1998) further tests what parts of the stock market development which affects economic growth. they use size, liquidity, volatility and integration with capital

markets as indicators of the stock market. It is an extensive research where they control for upcoming problems such as economic and political factors and find a significant relationship between stock market liquidity and economic growth. They do however not find any significant relationship between the other variables used.

Many years later when the availability of data is more present, Beck and Levine (2004) In an extensive research goes further to prove this stated linkage that Levine and Zervos (1996) suggests between the stock market development and economic growth. They firstly test the notion that financial development is unimportant for economic growth, but cannot find anything to prove this theory. Meaning, that there is a definite relationship between financial development and economic growth. As the relationship was proven, they further investigated the effects and found that both the banking system and stock market liquidity entered a growth regression positively, regardless of what control variables were present. In the paper they use the variables Turnover ratio, which is calculated as total value traded divided by total listed shares. They found that turnover ratio is an excellent measurement of stock market liquidity and further agreed with Levine (1991) that stock market liquidity and financial development overall plays an important role in economic growth. They also agree with Levine, Zervos (1998) that the best modelling of stock market size is market capitalization but does not test it relationship towards economic growth as the measurements have previously been proven to not affect it in Levine and Zervos (1998).

Papers in the recent years have however found success in finding a relationship between stock market size and economic growth. In Cooray (2010) he finds that the stock market is significantly positive in long run economic growth. He agrees with earlier findings on liquidity but also finds this connection in market capitalization. He also further empathizes the connection between human development and economic growth.

There have been other works with similar approach and result as the works on economic growth made by Levine et. al. These papers often focus on smaller samples and specific countries, such as Taivan (2016) work on Asian economies. She finds that there is a granger causality between financial development and economic growth. In fact, she even finds the causality as bidirectional, meaning that financial development affects economic growth but economic growth also affects financial development. There is also several papers which concludes the same equilibrium relationship, such as Bahadur (2006) on Nepal and Enisan

and olufisayo (2009) work on 7 sub Saharan countries where they find the same bidirectional relationship in cote D'ivore, Kenya, Morocco and Zimbabwe. Boubakari (2010) also finds this relationship in 2 out of 4 Euronext countries. These papers align with our assumption that the connection between the stock market and economic growth is thoroughly proven and it is one of the main assumptions taken in this paper. It should be noted that all the papers look for granger causality which is not identical to causality. Granger causality means that you look for a relationship where X can forecast Y and in a classic test for Causality you test if X causes Y (Hamilton, James D 1994).

There has not been much research made on our dependent variable, HDI as it is widely regarded as a good measurement of human development (Dervis, Kemal and Klugman 2011). It is however put to test in Ivanova, Marcellus and Srinivasan (1998) where the authors test the validity of the index and what parts of human development it predicts. They do so by analyzing the 3 parts of the old HDI: Life expectancy, adult literacy rate and the natural log of GDP per capita (PPP). They find that HDI is a good measurement of human development in present values but it fails to predict future values of human development. Meaning, that the index cannot be used as a tool to predict where a country is heading. Instead, it should be used as a comparative tool between nations at present time. They do however also find that the index needs further refinement in forms of changing the weights of the variables or entirely changing the equation. It should however be noted that this criticism is towards the old method used to calculate the HDI, meaning as the HDI was reconstructed in 2010, the refinements may possibly alter the paper's findings.

In a later study by Stanton (2007) she tries to critically review the history of HDI and how UNDPR have reacted to the critics of it. Her findings are that they have been very receptive to criticism on data, incorrect choice of indicators and poor specifications of HDI. She further emphasizes their agenda that the index is always open for improvements and comes to the conclusion that it has played a key role in human development. All in all, there is a consensus that HDI is a good measurement of human development.

In a paper recently released by the International monetary fund (2019), they test 3 explanatory variables against the 3 indicators of HDI – GNI, life expectancy at birth and Years of schooling. The paper both tests granger causality tests and a regression analysis with plenty of control variables. They find that public educational spending display a small positive effect on

GNI in the short run and larger effect in the long run. They also find that it has a positive effect on years of schooling, although not directly but more so in the long run. Lastly, they also conclude that public health spending and life expectancy has a significant relationship. These variables could possibly be used as control variables, depending on availability of data.

There's not a large amount of research on how the stock market affects HDI and Human development, as most of the research is focused on the stock market's effect regarding economic growth. However, there recently was a study by Ugherughe JE and MaryAnn NI, (2019) on stock markets indicators and if they affect HDI in sub Saharan countries which concludes that size have a significant impact on HDI in Mauritius, South Africa and Nigeria. The paper also found that stock market liquidity has a significant effect on Mauritius and South Africa but found it insignificant in Nigeria. However, as the tests are done on specific countries, the results can in no way be seen as either conclusive or representative but is still worth mentioning.

3. THEORETICAL FRAMEWORK

The capabilities approach was first pioneered by Amartya Sen and intended to bring a new perspective on development focused on people and their freedom to do with their lives as they desire based on their capabilities to do so. It can be viewed from a wide perspective ranging from if a person is properly nourished and has a roof over their head to more novelty things such as a person's ability to travel. Much like the HDI the capabilities approach is focused on the well-being of people when studying development (Guna Saigaran, Karupiah and S.Gopal, 1993).

The capabilities approach also rivals traditional development theory much like human development in that it aims to measure economic growth as a means to an end rather than the end itself much like human development. Inherently this equates to that economic growth will help realise human development and create greater opportunity for people to do with their lives as they please. The HDR that first included the HDI is partly developed by Amartya Sen as well, so it is not unexpected that key elements of the capabilities approach also play a big part in the view of how human development was perceived in the HDR (Stanton, 2007).

When quality of life tends to be lower, the fertility rate also tends to be higher. This comes as an effect of that in order to fulfil basic needs, extra workforce is needed and people get the notion that this can be achieved in the form of more children (Aassve, Engelhardt, Francavilla, Kedir, Kim, Mealli, Mencarini, Pudney and Prskawetz, 2005). Another aspect of quality of life is health and how to cope with upcoming circumstances such as malnutrition and diseases. How much of a nation's welfare that is directed towards the health expenditures can play a key role in human development.

Although economic growth is not the main theme of either human development or the capabilities approach it is an essential part of both. Economic means can help create the freedom to live meaningful lives through several ways for instance economic growth will help people afford better homes and have access to necessities such as clean water and food. Quality of life is not only to be measured in economic growth alone, but it will increase opportunity for people. Furthermore, the HDI and economic growth have a strong correlation (Szigeti, Tóth, Borzán and Farkas, 2013) and with the knowledge of the existing relationship between stock market development and economic growth it becomes interesting to examine

the relationship between stock market development and the HDI. The strong correlation between the HDI and economic growth is one of the assumptions made in this thesis.

Endogenous growth theory rests upon economic growth mainly generating through endogenous forces such as human capital (Romer, 1994). This view argues that economic growth relies more upon the inner workings of the system rather than outside forces. Levine (1997) theorized through endogenous growth theory that financial markets could affect economic growth in two areas: technological innovation and accumulation of capital. Prior research done by Levine (1991) found a relationship between stock market liquidity and economic growth.

Combining the theory behind the capabilities approach with endogenous growth theory and its relation to stock market development an interesting thought takes form of the relationship between stock market development and human development.

4. DATA

In order to answer our research question if Stock markets affect human development we will use a multivariable regression model. This will be used as we have several explanatory variables and 3 different control variables which have in previous work been proven to effect to HDI. All of the data for the explanatory variables and control variables are collected from the World Bank. The data for HDI comes directly from the united nation develop programme. A multivariable regression model looks as follows:

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} \ldots + \beta_k X_{ki} + \varepsilon_i$$

The dependent variable here is Yi and x1,x2 et cetera are either control variables or explanatory variables. All the variables used can be found in appendix A. The difference between explanatory variables and control variables is that we are not interested in what the control variables compute.

4.1 Countries

We have 58 countries concluded in our regression model which can be found in appendix B. Data is collected from all over the world but is mostly focused on those with a high HDI. As a lot of countries do not have functioning stock markets or data available over the defined time period, countries were chosen based on available data. For example Sweden, Denmark, Finland and Iceland had to be excluded as we could not find any data from Nasdaq Nordic. Other countries were also excluded on the basis of that there is not sufficient data. Some countries were kept as the gaps in data were not big enough to determine an exclusion of them.

4.2 Dependent variable

In order to model our question if the stock market has an effect on human development, we had to choose a variable which explains human development. We are using the Human development index (HDI) as our dependent variable. Although it has been criticized, it is still the best available measurement for human development.

The 3 components of HDI are: life expectancy index, education index and income index. Since the first HDR was released in 1990 the HDI has seen some changes in how to be calculated but have stayed similar over time. Countries are measured between a scale from 0-1 where 1 would be the optimal score (Staton, 2007). For the life expectancy index and education index this formula is used:

$$\text{Dimension index} = \frac{\text{actual value} - \text{minimum value}}{\text{maximum value} - \text{minimum value}}.$$

The income index is calculated with the natural logarithm of all values:

$$\text{Dimension Index} = \frac{\mathbf{ln}[\text{actual value}] - \mathbf{ln}[\text{minimum value}]}{\mathbf{ln}[\text{maximum value}] - \mathbf{ln}[\text{minimum value}]}$$

The life expectancy index has stayed the same except minimum and maximum values changing over the years. The education index and income index saw major change in 2010. The education index was calculated using adult literacy rate and gross enrolment ratio before 2010 (Klugman, 2009) this changed into using expected years of schooling and mean years of schooling (Kovacevic and Calderon, 2015). The income index was calculated using GDP (PPP) per capita but was changed to GNI (PPP) per capita. In the new version of the index a geometric mean is also used instead of a common mean of the three indexes to create the HDI. Maximum and minimum values have changed sporadically over the years depending on what minimum and maximum values were seen as optimal at estimating the index.

4.3 Stock market measurements and Explanatory variables

Variables in this paper have been thoroughly examined and handpicked from previous research. We are going to use 2 different methods of modelling the stock market in this paper: liquidity and size. As an indicator of liquidity we will use turnover ratio as % of GDP and stocks total value as % of GDP. For size we will use Stock market capitalization as % of GDP. Most of the papers on economic growth agree that stock market liquidity is the main factor affecting economic growth and questions may arise why we also include size in our research. As discussed in the literature review, many papers tried to model market capitalization against economic growth but found it insignificant. There are however later findings which contradicts this such as Cooray (2010). All the papers do however agree on that the best indicator for stock market size is market capitalization. further, The underlying

assumption which lays ground for these measurements is that size is positively correlated with the ability to mobilize risk and that liquidity eases how quickly the market works. It should also be noted that previous research is modelling the stock market against economic growth and there is no concluding research on the effects it might have on human development.

To conclude our 3 explanatory variables and their abbreviations which will be used:
SMC = Stock market capitalization as % of GDP
TR = turnover ratio as % of GDP
STV = Stocks total value as % of GDP

4.4 Control variables

We are using 4 different control variables in our multi regression model. All the variables have previously been used as control variables for HDI and were found to have a significant effect.

FR = Fertility rate, birth per woman
TOT = Terms of trade base index = (2000)
LFP = Labor force participation rate (female-male ratio)
PHS = Public health spending as % of GDP

The International Monetary Fund recently released a paper where a big set of control variables were used for HDI. We will use Terms of trade (ToT) and public health spending as % of GDP (PHS) in this paper. Terms of trade is the ratio of export prices to import prices and works to control for openness of a country, in specific GNI per capita. A high Tot can substantially affect the levels of GNI per capita and the base year used will be 2000. PHS was also tested and found to have significant relationship with life expectancy (Paliova, McNown and Nulle, 2019). The reasoning for not using the majority of the control variables from the IMF paper is that the data for them is not available for the majority of the countries in this study. For example literacy rate is not reported in most of the developed countries and public educational expenditures % of GDP is missing from the majority of our selected countries as well. Eren, Celik and Kubat (2014) conducted an extensive research on 9 different independent variables affecting HDI and concluded that the Labor force participation rate (female-male ratio) has a significant effect on HDI. Lastly in a thesis by Grzech, Patels And

Walker (2016) they modelled several variables against HDI in order to find out what affected it the most. They found fertility-rate to be the most significant factor in affecting HDI and it will also be used as a control variable in this paper as a way to model the health aspect of HDI.

4.5 Descriptive statistic:

In table 4.1 you can find our descriptive statistic with mean, Median, maximum, minimum, standard deviation and number of observations. As seen the data is unbalanced and will be covered in the method section. You can also notice that in our explanatory variables the standard deviation is a lot higher, meaning that it differs a lot more from the mean than our dependent variable.

4.1 Descriptive statistics

	HDI	LFP	PHS	FR	TR	TOT	STV	SMC
Mean	0.809082	69.08906	6.995005	1.892384	52.72623	108.7703	45.52488	73.30286
Median	0.822	74.37026	7.035382	1.75	33.66	100	15.44131	46.722
Maximum	0.953	94.04738	17.19726	4.109	480.2873	233.5779	952.6673	1086.34
Minimum	0.497	17.72152	2.320197	0.901	0.04951	50.19265	0.020981	0.737358
Std. Dev.	0.086309	16.15394	2.567686	0.602967	57.57924	27.04163	82.46937	111.978
Observations	1044	941	1040	1044	911	1043	969	992

5. METHOD

The aim of this study is to find out if 3 different stock market indicators in 2 subcategories affects human development, in specifics the human development index. In order to answer this question to our best ability 2 key assumptions had to be made and several papers have been thoroughly examined and discussed. The research will be conducted in form of a regression model with panel data. Further, this section will also cover some key criteria's which needs to be fulfilled before any analysis can be done.

5.1 Balanced/unbalanced data

Our dataset conducts 63 different countries worldwide. The dataset is to be considered unbalanced, as there are several gaps in the data and some data is missing from specific years. The reasoning for still using countries where there are gaps in data is that no dataset is perfect and by not including countries based on small gaps in data would severely hinder our ability to conduct meaningful research. As such the dataset used will be unbalanced.

5.2 Unit root test

In order to address the problems of having a spurious regression, we will test our variables for stationarity. A spurious regression means that you find a relationship between non-stationary variables that is merely a statistic trick, as in fact there is no relationship between the variables. This causes a lot of problems, as you can observe a relationship which is merely fictive (Dougherty, 2016, pp,490). Stationarity is often used simultaneously as "unit root", as most of the testing works in a way that you have a hypothesis, H0: variable has a unit root. Having a unit root means that you have a pattern in the variable that is unpredictable. (Dougherty, 2016, pp.506).

All of the computing in this thesis will be done through Eviews and we will test using an individual root. Dependent, explanatory and control variables will firstly be tested on Level and if needed, on first difference. There has always been a lot arguing regarding which unit root test is best to use and there really is no consensus on which test is the strongest. We will however in this thesis base our choice on Maddala and wu (1999) where they concluded that

the fisher tests were statistically better in a monte Carlo simulation than for example Im, Pesaran and Shin - test. There's 2 different fisher tests in Eviews called ADF and PP-test. We will Reject the null hypothesis only if both tests have a p-value below 0.05. In Table 1 you can find the different unit root tests computed. We can conclude that a unit root is present in some variables on level. The next step is then to decide what kind of tactic to apply in order to tackle the problem of the evidently unit root that is present. As we found that 2/8 variables contain a unit root at level but not in first difference, one of which is in our dependent variable HDI, a possible approach could be to create a dynamic model. This means that we add a lagged dependent variable to the regression in the form of HDI(-1), in order to cope with the problem of a evident unit root. This new model is Called ADL(1,0) which means that we have 1 lagged dependent variable in the form of HDI (Dougherty, 2016, pp.416). However, a lot of problems arise with this approach, more formally known as Nickell Bias. The bias of combining a dynamic model with a fixed effects model is problematic in the case of having a large set of observations(N) with a small sample of time periods(T), which is the case of our analysis. The problem can be summarized as that the regressor and the error terms correlate with each other, resulting in a bias for the estimators (Nickell,1981).

As adding a lagged dependent variable might bias our estimation, our last resort is to take the first difference of the variables possessing a unit root at level. This will make all of our variables I(0). This does also change our regression model in the way that we are now modelling the change in HDI versus our independent variables, in which terms of trade is also modelled as the first difference. The other variables will remain in level terms, as it does not make any sense in changing a variable which does not contain a unit root.

Table 5.1 - Unit root test

Variables:	**HDI**	**PHS**	**TOT**	**LFP**		**FR**	**STV**	**SMC**	**TR**
ADF- Fisher test:									
Level:	0.2329	0.8036	0.6117	0.0053***		0.0000***	0.0000***	0.0000***	0.0000***
First difference:	0.0000***	0.0000***	0.0000***						
PP- Fisher test									
Level:	0,0000***	0,2537	0,3660	0,0001***		0,0000***	0,0000***	0,0000***	0,0000***
First Difference:		0,0000***	0,0000***						
Order of integration:	I(1)	I(1)	I(1)	I(0)		I(0)	I(0)	I(0)	I(0)
**** = 1% significance* *** = 5% significance*									

5.3 Endogeneity

A factor which we were unable to affect for is endogenous variables. A endogenous variable is problematic as it means that a explanatory variable is either determined or changing with other explanatory variables in the model (Dougerthy, 2016 pp.344). In our case with panel data the options to cope with this problem gets very limited. The best way to account for this would be to apply instrument variables for our explanatory variables. Unfortunately, finding good instrumental variables that can be applied to our model and that correlates with the explanatory variables are extremely difficult. It is important that instrumental variables actually correlates with the explanatory variables or they might be misleading. Hence, no actions will be taken to address this (Bound et al, 1995).

5.4 Hausman test for Random effects

One key aspect when working with panel data is deciding between using random effects or fixed effect estimators. In order to conduct this we will do a correlated random effects - Hausman test. The null hypothesis for the test is H0: the individual specific effects are random. The test is done in a way that you test both fixed and random effects and if the difference between them is significantly different from zero, you reject the null. If the null is rejected, it is better to use fixed effects (Hausman, 1978). In this thesis the p value is less than 0,05 and the difference is significant from zero. Hence, the fixed estimator effect will be used. The main difference between the effects is that when applying fixed effects estimator to your model, you assume that the error terms are correlated with the explanatory variable. On the contrary, random effects estimator is the exact opposite (Dougherty,2016 pp531-540).

5.5 Fixed effects

The fixed effect estimator is best used when individual specific effects are correlated with the explanatory variable, which was the case observed in the Hausman test. In our case, the individual specific effects are simply country specific effects. In order to correctly specify our model, we will apply least squares dummy variable fixed effects. This means that a dummy variable will be added to the regression to cope with individual specific effects.(Dougherty, 2016, pp.535) Another dummy variable will also be added, as time specific effects are also present. The new regression model will look as follows:

$$Y_{it} = \alpha_i + \gamma_t + \beta X_{it} + \varepsilon_{it}$$

As noted in the model above, by adding dummy variables the efficiency of the Beta-parameters significantly decreases and is one of the downsides of using a fixed effects model with dummy variables(Dougherty, 2016 pp.242). α_i in the model equals the individual specific effects and γ_t equals the time specific effects.

5.6 Heteroscedasticity

One of the assumptions which needs to be accounted for is whether the error terms are heteroscedastic or homoscedastic. Pinder, (2017) explains it as unequal variance of the data along the regression line or simpler put, the spread of the dots are not constant. If

heteroscedasticity is present the p-value will be inaccurate and any testing done will be invalid or skewed. In order to cope with the possibility that heteroscedasticity may be present, we will use white's robust error with cross section. This means that we assume that the unequal variance in the data is present in the cross section.

5.7 Autocorrelation

Autocorrelation in regression models is a problem where your values over time have a distinct similarity, meaning that the covariance of the residuals from different time periods correlates with one another. autocorrelation is often observed in data which is collected across time, such as our data sample. To be certain that autocorrelation is present we perform a Durbin-Watson test on our equation. The results obtained from the test range from 0-4 where 0 equals positive autocorrelation and 4 equals negative autocorrelation. Results in this test close to 2 means that there is no autocorrelation present (Dougherty, 2016, pp.445). This test also has its limitations, such as showing incorrect values if including a lagged dependent variable in the right hand side of the equation.(Dougherty,2016, pp.453). Since we have cross section panel data with fixed effects, the implementation of cross section tests or the Arellano-Bond serial correlation test was unsuccessful, which means that the Durbin-Watson test is the best one available. we found the Durbin Watson statistic to be close to 2, which means that no autocorrelation is present in our data. The Durbin Watson test may however be skewed or biased as we have 2 variables which are calculated in first difference. In order to be certain that the problem of autocorrelation is accounted for, white's cross sectional error terms will also be used. White's cross sectional accounts for serial correlation in cross sections, which is where it is most likely to be present.

6. RESULTS

This research is based on one regression analysis on panel data conducted from 58 different countries ranging from all over the world. As previously discussed, we used individual and time fixed effects and 2 variables will be first differenced in order to make sure all variables were stationary. The relationship we looked for is if 3 stock markets indicators had any significant effect on the human development index. We were not looking at country specific relationships but rather if we can find any general relationship. We looked at a 5% significance level, meaning that we reject our hypothesis if the p-value is higher than 0.05.

Table 2 shows the result for our regression analysis. We could not conclude that any of the 3 explanatory variables have a significant effect on HDI as the p value is >0.05 in all 3 of them. Hence, we reject our hypothesis. Reasons for why we cannot find any significant relationship can arise from a range of factors. Our data is limited, as a lot of countries do not release the needed data for this research. World events such as the financial crisis in 2008 might also play a role in that our explanatory variables are skewed, as both market capitalization and turnover ratio seems to skyrocket around that time frame to later drop significantly the year after, quite the opposite of how the HDI moves as it always has a constant and steady growth. Although time fixed effects are added to address this, it is not certain that it captures the entirety of the effect.

The coefficients for the stock market had a small negative effect on HDI but no conclusion should be drawn from that fact as the p values are extremely high for all 3 of them. As no previous link between the stock market and human development have previously been observed, this work further conducts that no statistically significant effect is to be found between HDI and our given stock markets indicators. However, this was merely a small study on 58 countries ranging over 17 years, which means that no conclusion should be drawn from our results.

When we looked at our chosen control variables, 2 out of 4 was accepted with a p-value below 0.05. FR was found to negatively affect HDI, which is not surprising as it has previously been proven to affect HDI and the connection with poorer countries is well established. It is also expected that it affects it negatively, as a higher value of FR equals more births per woman and a higher birth rate per woman is linked to poverty (Birdsall, Griffin

1988). PHS has also previously been proven to have a relationship with Life expectancy, which is one of the components of HDI. This finding aligned well with our theory that public health expenditure should be higher and growing in more well developed countries. As for the two other variables not finding any significant effect on HDI, plenty of factors can play a role. TOT was for example logged and used as a lagged variable in the IMF paper. Their model was also slightly different and the inclusion of first differences and fixed effects on both individual and time might have played a factor in the results. This might also be the reason for why LFP was found insignificant but it also may be that other papers have used different countries, time periods or models.

The R-squared measures how much of the variance that our explanatory variables explains and was found to be 25.04 %. This might indicate that we did not have enough variables in our regression but as previously mentioned a lot of the control variables which we had in mind had to be cut out of the regression as the availability for the data is simply not there. This can also be seen as an indication that the stock market does in fact not affect human development. There's also the possibility that our method of choosing limited the results of our data. However, as Martin Rees famous quote "Absence of evidence is not evidence of Absence", our non-findings is not supposed to be seen as evidence for that the relationship between our variables does not exist (Rees, 1971 pp3).

Table 6. - Regression analysis

Dependent variable: D(HDI)				
Method: Panel Least Squares				
Date: 05/24/20 Time: 23:01				
Sample (adjusted): 2001 2017				
Periods included: 17				
Cross-sections included: 58				
Total panel (unbalanced) observations: 770				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
FR	-0.00392	0.001137	-3.44908	0.0006
LFP	3.69E-05	6.80E-05	0.542475	0.5877
SMC	-2.00E-06	3.59E-06	-0.55647	0.5781
STV	-2.49E-06	5.41E-06	-0.46062	0.6452
D(TOT)	-2.30E-05	2.31E-05	-0.99527	0.32
D(PHS)	0.000752	0.00037	2.03161	0.0426
TR	2.72E-07	7.05E-06	0.038622	0.9692
C	0.009349	0.005122	1.825058	0.0684
	Effects Specification			
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
Root MSE	0.003647	R-squared		0.250438
Mean dependent var	0.004499	Adjusted R-squared		0.163406
S.D. dependent var	0.004215	S.E. of regression		0.003855
Akaike info criterion	-8.17949	Sum squared resid		0.010241
Schwarz criterion	-7.69072	Log likelihood		3230.104
Hannan-Quinn criter.	-7.99139	F-statistic		2.877544
Durbin-Watson stat	1.924265	Prob(F-statistic)		0

7. DISCUSSION

Our study did not find a significant relationship between the three stock market indicators and the HDI. This finding does not mean that there is no concurrent relationship between human development and stock market development but simply that our method was unable to find such a relationship. A significant relationship was found between the HDI and fertility rate which was an expected result that was already proven to have the most significant relationship with the HDI of the control variables (Grzech, Patels And Walker, 2016). A significant relationship was also found between PHS and the HDI but a significant relationship was not found for LFP and TOT. Eren, Celik and Kubat (2014) found a significant relationship between LFP and the HDI before which shows that a significant relationship between the HDI and the stock market indicators used in this thesis cannot be entirely excluded either. It is also to be said that data collection was limited due to availability and only 58 countries were studied. Furthermore, the financial crisis of 2008 might have skewed the results since the HDI kept moving at a steady rate when stock markets all over the world plummeted.

Economic growth has been established before to be affected by stock market development (Cooray, 2010) especially stock market liquidity (Levine 1991) but economic growth is only one aspect of human development. Therefore it is logical that the HDI would have a weaker relationship to stock market development than economic growth alone. For further research on stock market development and its relationship with human development the HDI could be separated into the three indexes it is composed of much like what the IMF report (Paliova, McNown and Nulle, 2019) did but instead to specifically study the relationship of the three indexes with stock market development. This could help to understand the effects that stock market development has on each part of the indexes, being life expectancy, education and income

The idea of this thesis to study stock market development and the HDI comes from previous work establishing a significant relationship between stock market development and economic growth (Levine 1991). Economic growth is inevitably an aspect of human development and the two highly correlate (Szigeti, Tóth, Borzán and Farkas, 2013) which in turn created the thought that stock market development might have a significant relationship with the HDI

since . Much more work needs to be conducted in this area of development, as there is no conclusive research on this relationship.

There is definitely some weaknesses in our model that can be fixed with the right measurements. More data is needed to be collected and over much longer time periods. It can also be interesting to test in specific countries and label them in subcategories to see if there's any relationship to be found. For example, you can use the HDR's categorization of the HDI with low, medium and high human development and set this against different stock market indicators to see if there's a difference category wise. Lastly, there's also the possibility that we have a problem with endogeneity. However, the only certain way for us to handle that is by using instrumental variables and unfortunately that is not something we have available for this thesis.

The capabilities approach and its creator Amartya Sen, who later came to also be a part of the HDR viewed economic growth as a means to an end. Economic growth not being the ultimate goal but rather a tool to help people live better lives (Stanton, 2007). The income index as a part of HDI shows this and it makes for a valuable part of human development, but it also means that more than economic growth alone is necessary for human development. The impact that stock markets have on economic growth should then in theory also impact human development but the impact might not be as strong considering that the stock market alone does not make up for all economic growth, for example Levine and Zervos (1996) found that the banking system had a bigger impact on economic growth than stock market development. Combining the two factors of economic growth being one aspect of human development and stock markets development not explaining all of economic growth also might be the reason for the study not providing significant results.

The results provided by this study might not disregard or confirm an existing effect on human development at the hand of stock market development but considering the lack of research on this area it paves the way for future research. As stock markets are an important aspect of the modern economy it is important to understand how it affects human development especially in countries where human development is of the essence.

8. CONCLUSION

In this thesis the relationship between key stock market indicators and human development have been researched. No conclusive remarks can be made about the relationship since it did not prove to be significant but significance cannot be ruled out either. The Human Development Index was used as an indicator for human development and three variables for stock market development: market capitalization, turnover-ratio and stocks traded value. To make this examination data from 58 different countries over 17 years were used sampled based on availability of data and was conducted over panel data.

From a theoretical standpoint the study was interesting because of the lack of research in the field of stock market development related to human development. Previous research focused on stock market development related to economic growth and the connection between economic growth and human development. This thesis aimed to establish a direct link between stock market development and human development based on these premises.

As the thesis was not conclusive further research in the area needs to be made. Since the HDI is made up of three separate indexes the stock market indicators could be tested against them individually to further understand how stock market development affects human development. Although the study was inconclusive it adds value and opens up the door for future research on the topic.

9. REFERENCES

Alexa Grzech, Kanhai Patel, & James Walker A CrossCountry Analysis: the Effect of Income, Life Expectancy, and Education on the Human Development Index (2016) Georgia Institute of Technology

Ake, Boubakari, The Role of Stock Market Development in Economic Growth: Evidence from Some Euronext Countries (February 28, 2010). International Journal of Financial Research, Vol. 1, No. 1, pp. 14-20, 2010

Akinlo A.Enisan and Akinlo O. Olufisayo (2009*) Stock market development and economic growth: Evidence from seven sub-Sahara African countries* Journal of Economics and Business, Vol: 61, Issue: 2, PP: 162-171

Arnstein Aassve, Henriette Engelhardt , Francesca Francavilla , Abbi Kedir, Jungho Kim, Fabrizia Mealli , Letizia Mencarini , Stephen Pudney & Alexia Prskawetz "Poverty and Fertility in Less Developed Countries: A Comparative Analysis" (2005-2013)

Asmita et al. "Analysis of Factors Affecting the Human Development Index in North Sumatra Province." (2017) volume 19, Issue 10. Ver. VII., PP 27-36

A Spears - Atlantic Economic Journal, 1991 - questia.com Financial development and economic growth-causality tests

A. Stanton, Elizabeth (2007). "The Human Development Index: A History". PERI Working Papers: 14–15

Beck, T., Levine, R. Stock markets, banks, and growth: Panel evidence, (2004) *Journal of Banking and Finance*, 28 (3), pp. 423-442

Birdsall, M. N., & Griffin, C. C. (1988). Fertility and poverty in developing countries Journal of Policy Modeling Volume 10, Issue 1, April 1988, Pages 29-55

Bound, J., Jaeger, D., & Baker, R. (1995). Problems with Instrumental Variables Estimation When the Correlation Between the Instruments and the Endogeneous Explanatory Variable is Weak. *Journal of the American Statistical Association, 90*(430), 443-450.

Cooray,Arusha Do stock markets lead to economic growth? Journal of Policy Modeling, 2010, vol. 32, issue 4, 448-460

Dervis, Kemal, and Jeni Klugman. "Measuring Human Progress: the Contribution of the Human Development Index and Related Indices." *Revue D'économie Politique*, vol. 121, no. 1, 2011, pp. 73–92.

Dougherty, Christopher (2016) Introduction to Econometrics 5th Edition Oxford: Oxford university press
James douglas Hamilton, James D 1994 Time series analysis

Guna Saigaran, Nithiya & Karupiah, Premalatha & S.Gopal, Parthiban. (2015). The Capability Approach: Comparing Amartya Sen and Martha Nussbaum

(Grzech, Patel,s Walker 2016) A CrossCountry Analysis: the Effect of Income, Life Expectancy, and Education on the Human Development Index

Hausman, J. A. (November 1978). "Specification Tests in Econometrics". Econometrica. 46 (6): 1251–1271
Haq, Mahub ul. "Human Development Report 1990" (1990)

Kovacevic, Milorad & Cecilia Calderon. "Training Material for Producing National Human Development Reports" (2015)

Levine, Ross (1991)Stock Markets, Growth, and Tax Police Journal of Finance, 1991, vol. 46, issue 4, 1445-65

Levine, Ross. (1997). Financial Development And Economic Growth: Views And Agenda. Journal of Economic Literature. 35. 688-726.

Levine, Ross and sara Zervos (1996) Stock market development and long-run growth World Bank Economic Review Volume 10, Issue 2 Published: May 1996
Pages: 323 - 339

Levine, Ross and sara Zervos (1998) Stock Markets, Banks, and Economic GrowthAmerican Economic Review, 1998, vol. 88, issue 3

. Mirac Eren, Ali Kemal Celik & Arif Kubat, Determinants of the Levels of Development Based on the Human Development Index: A Comparison of Regression Models for Limited Dependent Variables, 6 Rev. Eur. Stud. 10 (2014).

Nickell, Stephen. "Biases in Dynamic Models with Fixed Effects." *Econometrica*, vol. 49, no. 6, 1981, pp. 1417–1426. *JSTOR*, www.jstor.org/stable/1911408. Accessed 24 May 2020.

G. S. Maddala Shaowen Wu (1999) A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test Oxford bulletin of economics and statistics special issue (1999)

Peter C. B. Phillips, and Pierre Perron. "Testing for a Unit Root in Time Series Regression." *Biometrika*, vol. 75, no. 2, 1988, pp. 335–346. *JSTOR*. Accessed: 19 may 2020

Paliova, Iana Robert McNown and Grant Nülle (2019) Multiple Dimensions of Human Development Index and Public Social Spending for Sustainable Development

Srinivasan, G I Ivanova, FJ Arcelus, - Social indicators research, 1999 – Springer An assessment of the measurement properties of the human development index

Jonathan P. Pinder, in Introduction to Business Analytics using Simulation, 2017

Romer, Paul M. 1994. "The Origins of Endogenous Growth." *Journal of Economic Perspectives*, 8 (1): 3-22.

Sen, Amartya. “Development: Which Way Now” *The Economic Journal,* Volume 93, Issue 372 (1983) page 745-752

Surya Bahadur G. C., and Suman Neupane. (2006). Stock Market and Economic Development: a Causality Test. Journal of Nepalese Business Studies, Vol.3, No.1.

Szigeti, Cecilia; Tóth, Gergely; Borzán, Anita; and Farkas, Szilveszter (2013) "GDP Alternatives and their Correlations," Journal of Environmental Sustainability: Vol. 3: Iss. 3, Article 3.

(taivan, 2016) Ariuna Taivan, (2016) "The causality between financial development and economic growth: case of Asian economies", Economics Bulletin, Volume 36, Issue 2, pages 1071-1082

Ugherughe Ediri (2019) Stock Market indicators and Human Development Index in Sub-Saharan Africa: The Case of Mauritius, Nigeria and South Africa (1997 - 2017)

The World Bank. (2019). World Bank Open Data. Available at https://data.worldbank.org/ [Accessed: 6 May 2020]

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9. APPENDIX

9.2 Appendix A

Variables	Descriptions	Sources
HDI	Human development index, scale between 0-1. Dependent variable.	UNDPR
STV % of GDP	Stocks traded total value as % of Gross domestic product. Measure of size.	The World Bank
SMC % of GDP	Stock market capitalization (Markets total value) as % of GDP. Measure of Size.	The World Bank
TR in %	Turn-over ratio in %. Domestic shares traded divided by market capitalization. Measure of liquidity	The World Bank
LFP in %	Labor force participation rate female-male ratio. Proportion of people ages 15 that's economically active.	The World Bank
FR	Fertility rate. Measurement of birth per woman.	The World Bank
PHS % of GDP	Public health spending in % of GDP. Measures how much a country spends on its healthcare.	The World Bank
TOT	Terms of trade. % of export unit value indexes divided by % of import unit value indexes. Base year 2000.	The World Bank

9.1 Appendix B

Countries included:

Norway	Colombia	Iran	Croatia
Switzerland	Peru	Mauritius	Argentina
Ireland	China	Panama	Russian Federation
United Arab Emirates	Spain	United Kingdom	Egypt
Poland	Slovenia	New Zealand	Canada
Australia	South Africa	Mexico	Romania
Thailand	Turkey	Hungary	Cyprus

Hong Kong	India	Sri Lanka	Bulgaria
Germany	Jordan	Costa Rica	Kazakhstan
France	Belgium	Malaysia	Greece
Malta	Japan	Bahrain	Israel
Italy	Austria	Singapore	Philippines
Korea	Netherlands	Luxembourg	Portugal
Saudi Arabia	Czechia	United States	Brazil
Chile	Slovakia		

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