Macro-economic determinants of the IPO waves: An assessment of G-7 countries [version 1; peer review: awaiting peer review]

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Abstract

Background: The purpose of this study was to reveal the macroeconomic determinants that companies take into account when scheduling initial public offerings (IPOs).

Methods: For this purpose, the relationship between the frequency of the IPOs and the selected macroeconomic indicators in the stock market of the G-7 countries for the period 1999-2020 was examined by panel data analysis method. A random effect model was used as econometric model in the analysis, and the Driscoll-Kraay resistant standard estimator developed against deviations was used in the application of the model.

Results: According to the results of the analysis, it was determined that stock market returns have a positive and significant effect on the volume of public offerings.

Conclusions: Based on our findings, it can be concluded that companies take into account the periods when stock market returns are relatively high for timing the IPO.

Keywords

Introduction

Initial public offerings (IPOs) are one of the equity financing methods that companies apply in capital markets. As a strategic financing process, public offerings play a critical role in the financial success of companies. The advantages and disadvantages of IPOs for companies are a matter of debate in the literature. The company that makes the IPO gains the status of a publicly traded company, is listed on the stock exchange, and thus the stocks are traded among the investors in the secondary market, that is, a liquid market is formed for the investors. In addition to this, after issuance process, the firms, as a publicly traded firm, have the opportunity to raise capital under much more favorable terms in the coming years (Ibbotson and Ritter, 1995). On the other hand, public offerings have many direct and indirect costs, such as the intermediary costs paid to the financial institutions and the listing fee paid to the regulatory institutions; these are accepted as one-time costs, while the obligation of the firms to provide information to the regulatory institutions on a regular basis is accepted as a continuous cost (Ibbotson and Ritter, 1995). Considering other factors such as company owners are sharing the management with others, companies should carefully evaluate advantages and disadvantages during the public offering process.

Public offerings are one of the most important issues in corporate finance. There have been many studies on initial public offerings in the literature. While some of the studies have examined the macro- and micro-determinants that lead companies to go public, some have examined the short and long-term price performance of stocks after the public offering. For example, Chemmanur and He (2011), Rydqvist and Högholm (1995) and Draho (2004) have studied the reasons for companies to go public and the frequency of public offerings. Loughran and Ritter (2004), Booth and Chua (1996), Ljungqvist (2007), Ritter and Welch (2002), Ritter (1984) et al. focused on price movements and their determinants. In studies on the causes and frequency of public offerings, hypotheses such as hot and cold public offerings have been developed. Many hypotheses such as Winner’s Curse by Rock (1986) have been put forward regarding the post-IPO price performance.

In this study, macroeconomic determinants that affect the frequency of IPOs was examined. In other words, we tried to determine which indicator companies take into account for timing of the public offering. The study is carried out on the G-7 countries for the period 1999-2020 using the panel data analysis method.

The number, volume and returns of IPOs are influenced by both the firm-related and macroeconomic environment and intermediary institution behaviors. For example, investment banks have a very high public offering experience, as they constantly manage public offerings. For this reason, the information produced by investment banks for market participants in the public offering processes provides significant guidance both companies and investors. Particularly during periods of heavy issuance and high initial returns, the information produced by investment banks improves the quality of IPOs, enabling previously low-quality firms to go public and increasing secondary market prices, synchronizing high IPO volumes and high first-day returns (He, 2007).

In the following part of the study, research in the international literature on this subject were examined. The relationship between the frequency of public offerings and the macroeconomic indicators selected for this study were then analyzed. In the last part of the study, the findings were interpreted and evaluated.

Research limitations and further research suggestions

The sample for the study consisted only of G-7 countries, which are developed markets.

In this respect, a comparative analysis and interpretation between country groups cannot be made, since the results of emerging or underdeveloped markets were not included in the study. However, it is recommended to conduct similar analyzes on other country groups in order to obtain more comprehensive and comparative results.

In addition, in this study, macroeconomic factors that are thought to be effective on the number of IPOs were included, and micro factors related to the company were ignored. It will be possible to obtain more meaningful results by including micro factors in the model.

Literature review

Studies on the number of initial public offerings were examined. The majority of the studies in the literature have analyzed the trend of IPOs in terms of number and volume and have created the concepts known as IPO Wave and Hot and Cold Issue markets in the literature. In most of the studies in the literature, the markets in which the number and volume of IPOs increase gradually are defined as “hot issue markets”, while the markets where the number and volume of IPOs decrease are defined as “cold issue markets”. In hot issue markets, many companies can plan their IPOs for this period, as the investor’s demand for the stock market is increasing. This way, the company makes a successful public offering and the investors have the opportunity to obtain abnormal returns in the short term thanks to the high discounts they obtain.
Pástor and Veronesh (2005) developed an optimal IPO timing model for firms. They emphasized that many studies in the literature explained the change in IPO volume over time with the concept of market inefficiency, where IPOs are made when stocks are overvalued. Contrary to previous literature, they created a model in which the fluctuation in the volume of initial public offerings occurs without any mispricing mechanism and the volume of the IPO is more closely related to recent changes in stock prices rather than the level of market stock prices. In the model, the variables that companies take into account during the public offering are, respectively: expected market return, expected aggregate profitability and prior uncertainty about the average future profitability of IPOs. According to the results of the analysis, they determined that economic expansions are highly correlated with the number of companies that go public, which is positively correlated with underpricing. In line with the model they created, greater cross-sectional return variance and higher delisting rates were detected for hot market public offerings.

Buttimer, Hyland and Sanders (2005), in their study, comparatively examined the waves of IPOs in the real estate investment trust (REIT) sector and the waves of general initial public offerings. In terms of initial returns, it was observed that the REIT sector provided lower returns than the general market average after the IPO waves. In addition, the long-term underperformance anomaly, which is frequently observed in stock markets according to many studies such as Ritter (1991), Loughran and Ritter (1997), Levis (1993), Schultz (2003) among others, has not been observed in the REIT sector. Based on the findings of their study, authors stated that the Capital Demand Hypothesis best describes the REIT public offering market.

Yung, Colak and Wang (2008) created a model in which real investment opportunities that change over time cause adverse selection in the market for IPOs. As a result of the analysis, it has been determined that economic expansions are highly correlated with the number of companies that go public, which is positively correlated with underpricing. In line with the model they created, greater cross-sectional return variance and higher delisting rates were detected for hot market public offerings.

Christoffersen, Nain and Tang (2010) examined the waves and the quality of IPOs. They stated that the quality of the public offering will not be the same in the first and later periods of the IPO wave. They noted that in the early stages of the IPO wave, the average quality of IPO stock is low when initial returns and IPO demand are low. However, later in the IPO wave, when initial returns and IPO demand are low, IPOs have better operating performance, higher market share, and consequently higher long-term abnormal returns. According to the results of the study, they found that institutional investors benefit from short-term high returns in early public offerings, but they prefer IPOs that are done in later stages of the IPO wave thanks to their higher quality in the long run.

In their study, Tran and Jeon (2011) analyzed the macroeconomic factors that were effective on the initial public offerings in the US capital market during the 1970-2005 period. By applying time series econometric methods in the analysis, they determined the long-term balance between macroeconomic variables and public offerings. As in many studies, Tran and Jeon also found that stock market return performance and volatility have the most significant impact on the timing of the IPO. In their study, they also examined the effects of interest rates and bond market returns. They found that there are not only long-term but also short-term statistically significant relationships between macroeconomic variables and IPO activities.

Angelini and Foglia (2018) examined the short- and long-term relationships between initial public offerings and macroeconomic factors in the UK stock market for the period 1996-2016. In the analysis, they sought answers to the questions of how macroeconomic conditions affect the initial public offerings and how long the recent shock effect lasted. Business cycle, volatility, interest rates and stock returns were used as macroeconomic variables. According to the results of the correlation analysis made in the study, it was determined that the business cycle, volatility and interest rate variables could explain the change in the number of IPOs. However, unlike many studies in the literature, no significant effect of stock market performance on the number and timing of IPOs could be detected.

Thanh (2020) used macroeconometric models to examine the cycles of initial public offerings in US stock markets. According to the results of the time series analysis they applied in their studies, they determined the strong and negative effect of macroeconomic uncertainty on the public offering activity. It has been determined that a one-unit standard deviation increase in macroeconomic uncertainty reduces the monthly number of initial public offerings by approximately four units in the long run. In the analysis, they also found that both the decrease in the number of IPO applications and the increase in withdrawn IPOs contributed to the decrease in the number of IPOs in response to an uncertainty shock.

Carosi and Mengoli (2021) analyzed local IPO waves in their studies. They analyzed public offerings on the basis of region and sector. They found that the waves of public offerings overlapped on a sectoral and regional basis. In other words, public offerings on a sector basis are similar to public offerings on a regional basis. They observed that IPOs at the beginning of the IPO wave were equally priced lower than IPOs at the end of the wave. According to the results of the
analysis, it was determined that the IPO decision is sensitive not only to the high valuations of the companies in the same sector, but also to the high valuations of the companies in the same region but in different sectors.

**Methods**

**Dataset and sample structure**

In the study, we examined whether macroeconomic variables have an effect on the frequency of public offerings. Since the aim is to determine the factors affecting the IPO wave through developed capital markets, the sample consists of G-7 countries. The analysis period covered the period 1999-2020, and annual data were used in the analysis.

Macroeconomic indicators such as annual consumer inflation, stock market returns and economic growth over the years (GDP growth) were used as independent variables. Explanations regarding on variables included in analysis are provided in Table 1 as follows.

Our preliminary expectations were a negative relationship between consumer inflation and the frequency of public offerings, and a positive relationship between stock returns and economic growth and frequency of public offerings.

**Methodology**

In the study, the relationship between the IPO waves (frequency) and macroeconomic variables were analyzed in terms of country sections. For this reason, panel data analysis method was used. In the analysis, it was deemed appropriate to apply the random effect model as the econometric model. While macroeconomic variables were included in the analysis as independent variables, the number of IPOs was included in the analysis as a dependent variable.

Since there was a cross-section dependency between the series in the analysis, the stationarity of the data was measured with the Peseran (2007) unit root test, which is one of the second-generation unit root tests. Afterwards, the Hausman test was applied to determine the econometric model to be applied. According to the results of the test, the application of the random effect model was deemed appropriate and the Driscoll-Kraay resistant standard estimator developed against deviations was used in the application of the model.

### Table 1. Descriptions of variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer inflation</td>
<td>Inflation is measured through consumer price index. This index indicates annual change in % in cost to average individual of buying goods and services.</td>
</tr>
<tr>
<td>Stock market returns</td>
<td>Average annual return over the daily closing prices of each country's national share index.</td>
</tr>
<tr>
<td>GDP growth</td>
<td>Annual change in % of GDP based on market prices and constant local currency.</td>
</tr>
</tbody>
</table>

*Source: https://databank.worldbank.*

### Table 2. Descriptive statistics.

<table>
<thead>
<tr>
<th>Descriptive statistics</th>
<th>IPOs</th>
<th>GDP growth</th>
<th>Stock returns</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>84.94156</td>
<td>0.012248</td>
<td>0.036149</td>
<td>0.014812</td>
</tr>
<tr>
<td>Median</td>
<td>56</td>
<td>0.01695</td>
<td>0.05445</td>
<td>0.016</td>
</tr>
<tr>
<td>Maximum</td>
<td>486</td>
<td>0.0687</td>
<td>0.3999</td>
<td>0.039</td>
</tr>
<tr>
<td>Minimum</td>
<td>0</td>
<td>-0.094</td>
<td>-0.3632</td>
<td>-0.013</td>
</tr>
<tr>
<td>Std. dev.</td>
<td>93.52817</td>
<td>0.02532</td>
<td>0.157667</td>
<td>0.01052</td>
</tr>
<tr>
<td>Skewness</td>
<td>1.996234</td>
<td>-1.804778</td>
<td>-0.318524</td>
<td>-0.237892</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>7.271059</td>
<td>7.328356</td>
<td>2.391868</td>
<td>2.596243</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>219.3329</td>
<td>203.8162</td>
<td>4.97113</td>
<td>2.498583</td>
</tr>
<tr>
<td>Probability</td>
<td>0</td>
<td>0</td>
<td>0.08303</td>
<td>0.286708</td>
</tr>
<tr>
<td>Sum</td>
<td>13081</td>
<td>1.8862</td>
<td>5.5669</td>
<td>2.281</td>
</tr>
<tr>
<td>Sum Sq. Dev.</td>
<td>1338370</td>
<td>0.098089</td>
<td>3.803388</td>
<td>0.016934</td>
</tr>
<tr>
<td>Observations</td>
<td>154</td>
<td>154</td>
<td>154</td>
<td>154</td>
</tr>
</tbody>
</table>
**Results**

**Descriptive statistics**

Descriptive statistics for the sample used in the study are shown in Table 2 below.

Correlation analysis is one of the most typical analyzes used to examine the relationship between variables. Pearson’s correlation analysis was used in this study, as the data showed normal distribution.

The correlation relationship between the variables is shown in Table 3 below.

According to the results of the correlation test, since the degree of correlation between the variables varies between 0.05 and 0.49, there was a positive but weak relationship. The degree of correlation differed according to the variables used. For example, there was a very weak correlation of 0.05 between stock returns and inflation, while a weak correlation of 0.49 between the GDP growth and stock returns. A strong and very strong relationship between the variables in the correlation analysis should have a degree of correlation between 0.70-0.89 and 0.90-1.00, respectively. As a result, according to the results of the analysis, there is a weak relationship between the variables in this sample.

**Unit root test**

In order not to encounter the spurious regression problem in the analysis, it is necessary to measure the stationarity of the series before the regression analysis. However, in order to determine which stationarity test will be used, a cross-section dependency test should be applied. According to the result of the cross-sectional dependence, the appropriate unit root test was applied. Cross-section dependence was tested with Pesaran (2004) cross-section dependence method.

The hypotheses of this test were as follows:

\[ H_0: \text{There is no cross-section dependence between the series.} \]

\[ H_1: \text{There is a cross-section dependence between the series.} \]

The results of the test are shown in Table 4 below:

According to the results of the test, there was a cross-sectional dependence between the series. As a consequence, Pesaran (2007) second generation unit root test was applied, taking this situation into account.

The hypotheses of these tests were as follows:

\[ H_0: \text{Series are not stationary.} \]

\[ H_1: \text{Series are stationary.} \]

**Table 3. Correlation analysis.**

<table>
<thead>
<tr>
<th></th>
<th>Stock-returns</th>
<th>Inflation</th>
<th>GDP-growth</th>
<th>IPOs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock-returns</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflation</td>
<td>0.05</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP-growth</td>
<td>0.49</td>
<td>0.32</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>IPOs</td>
<td>0.30</td>
<td>0.12</td>
<td>0.25</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 4. Pesaran (2004) cross-section dependency (CD) test.**

<table>
<thead>
<tr>
<th>Variable</th>
<th>CD-test</th>
<th>p-value</th>
<th>Correlation coefficient</th>
<th>abs (corr)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPOs</td>
<td>7.84</td>
<td>0.00</td>
<td>0.365</td>
<td>0.366</td>
<td>H0 cannot be accepted</td>
</tr>
<tr>
<td>StockReturns</td>
<td>16.49</td>
<td>0.00</td>
<td>0.767</td>
<td>0.767</td>
<td>H0 cannot be accepted</td>
</tr>
<tr>
<td>Inflation</td>
<td>10.24</td>
<td>0.00</td>
<td>0.476</td>
<td>0.51</td>
<td>H0 cannot be accepted</td>
</tr>
<tr>
<td>GDPGrowth</td>
<td>17.84</td>
<td>0.00</td>
<td>0.83</td>
<td>0.83</td>
<td>H0 cannot be accepted</td>
</tr>
</tbody>
</table>
The results of the test are shown in Table 5 below.

According to the unit root test results, IPOs and Inflation were found to be stationary after taking the first difference, while the GDP growth and stock returns variables were found to be stationary at level values. Therefore, non-stationary IPOs and inflation variables were included in the regression analysis after taking their first difference. For this reason, a cointegration test was not be applied in the study.

**Econometric model**

A Hausman test was used to determine the econometric model to be established. The Hausman test results are summarized in Table 6 below.

According to this result, the random effect model was used as the econometric model.

Tests related to autocorrelation and heteroscedasticity problems in the model were performed in Table 7 and Table 8 below.

In the model, macroeconomic variables were used as independent variables, and IPO numbers were used as dependent variables, and a random effect regression analysis with the Driscoll-Kraay resistant standard estimator was applied.

Regression analysis results are shown in Table 9 as follows.

According to the results of the regression analysis, stock returns is the only variable that has a positive and significant effect on the number of IPOs. The effects of all other variables on the frequency of IPOs were not found significant. Based on the analysis findings, it can be stated that companies take into account the stock returns variable in timing the public offering. The correlation between stock returns variable and IPOs was found to be positive. In other words, as the stock market index returns increase, companies may choose to go public in order to enter the hot public offering market and

<table>
<thead>
<tr>
<th>Variable</th>
<th>p-value</th>
<th>First difference</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPOs</td>
<td>0.636</td>
<td>0.00</td>
<td>I(1)</td>
</tr>
<tr>
<td>Stock returns</td>
<td>0.09</td>
<td>-</td>
<td>I(0)</td>
</tr>
<tr>
<td>Inflation</td>
<td>0.072</td>
<td>0.00</td>
<td>I(1)</td>
</tr>
<tr>
<td>GDP growth</td>
<td>0.04</td>
<td>-</td>
<td>I(0)</td>
</tr>
</tbody>
</table>

**Table 5. Unit root test results.**

<table>
<thead>
<tr>
<th>Chi² (3)</th>
<th>p-value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.74</td>
<td>0.8956</td>
<td>Random effect model is used</td>
</tr>
</tbody>
</table>

**Table 6. Hausman test results.**

<table>
<thead>
<tr>
<th>F</th>
<th>p-value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.874</td>
<td>0.2201</td>
<td>There is no autocorrelation problem.</td>
</tr>
</tbody>
</table>

**Table 7. Autocorrelation test.**

<table>
<thead>
<tr>
<th>Chi²</th>
<th>p-value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.74</td>
<td>0.0295</td>
<td>There is no autocorrelation problem.</td>
</tr>
</tbody>
</table>
maximize their issuance proceed (or reduce the underpricing degree of public offerings). The findings are compatible with many studies in the previous literature, especially Pástor and Veronesh (2005), and Tran and Jeon (2011).

**Discussion and conclusions**

IPOs are one of the most important methods used by companies as long-term equity financing in the capital market. In an IPO, the issuer receives issuance income in exchange for shares sold to investors. Investors, on the other hand, become a shareholder of a newly publicly traded company, often taking advantage of the discounted issue price, and as long as they hold the stock in the future, they will receive dividend income or can get capital gain by selling the discounted shares at a higher price. Considering the above-mentioned advantages and long-term results of public offerings, it was found that this strategic financing process has an important place in the financial success of companies. For this reason, the success of the IPOs is critical for all parties in the IPO process as well as for the general market functioning. Due to the importance of IPOs, there have been numerous studies on IPOs in the literature. The majority of the studies focused on the short- and long-term price performances and determining factors of IPOs, as well as the cycle of IPOs.

In this study, macroeconomic factors that were thought to be effective on the cycle of IPOs were examined, and especially whether economic growth, inflation and stock market returns are determinants on the number of IPOs. The analysis was applied to the G-7 countries representing the developed world economies, for the period 1999-2020.

In the analysis, first of all, the stationarity of the series was tested with the Pesaran (2007) unit root test, which takes into account the cross-section dependence. The series that were not stationary at the values level values were included in the regression analysis by considering their primary difference. Before the regression analysis, we tested whether the problems of autocorrelation and heteroscedasticity existed in the model, and it was determined that there were no such problems in the model. A Hausmann test was applied in the selection of the econometric model to be established, and according to the results obtained, it was deemed appropriate to use the random effect model. Regression analysis was performed using the Driscoll-Kraay resistant standard estimator, which was resistant to deviations and errors.

According to the results of the analysis, it was determined that only the stock returns variable, among the independent variables in the model, had a significant effect on the number of initial public offerings. The stock returns variable has a positive effect on the number of IPOs. In other words, as stock return increases, the number of IPOs also increases. Based on this finding, it can be stated that stock returns is one of the macroeconomic factors that affect companies’ public offering decision. In other words, companies prefer to go to public offerings during periods when stock market returns increase. The inflation and GDP growth variables, which were the other variables investigated in the analysis, could not have a significant effect on the frequency of the initial public offering.

In this analysis, only the macroeconomic determinants, which are thought to be effective on the IPO waves, were examined. In addition, more comprehensive and meaningful results can be obtained by including microeconomic factors
that may affect the number of IPOs in the analysis. A study on developing economies in addition to developed world economies will be extremely useful in terms of showing comparatively how macro- and microeconomic factors change according to the level of development of countries.

**Data availability**

**Underlying data**

Inflation and GDP growth rate data were retrieved from WorldBank databank and filtered for the G-7 countries for the period of interest (https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG). In the menu on the right of the home page, the indicators for sample countries can be selected. No account creation is needed.

IPO numbers were retrieved from Statista. Scholars don’t have to create account and make subscription on Statista when they are downloading IPO numbers for each country seperately. For multiple countries and periods, the system requires to create an account.

Stock returns were retrieved from Investing.com. In the search box located at the top of the home page of investing, equity code is written and profile page of related stock will be opened. The historical data section is located just above the price chart. After determining start and end dates all information regarding on closing price, opening price, highest and lowest will be visible.

All data used are open access.

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