Sell in May and Go Away Effect: Evidence from Developed, Emerging, and Frontier Markets

by

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A thesis submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Master of Science

Auburn, Alabama
December 14, 2013

Keywords: Sell in May Effect, Developed Markets, Emerging Markets, Frontier Markets

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Abstract

This thesis represents a comprehensive study of the Sell in May Effect. I follow the work of Bouman and Jacobsen (2002) and Andrade *et al.* (2013) on a large sample of countries consisting of 24 developed, 21 emerging and 25 frontier markets. I find evidence of the Sell in May Effect in developed, emerging as well as frontier markets. The strongest Sell in May Effect is found in emerging markets, representing 11.07% higher returns during the November-to-April compared to May-to-October time periods.

Acknowledgments

I would like to express sincere appreciation to my major professor, Dr. Jitka Hilliard for her continuous support for my thesis. Without her effort and guidance, I couldn't finish this thesis. During my one and a half year's study in Auburn University, she has given me valuable suggestions.

Also, I would like to thank other members of my graduate committee, Dr. Jimmy Hilliard and Dr. Marlin Jensen for their insightful and helpful comments on my thesis.

Finally, I would like to thank my parents and my friends for supporting and encouraging me to complete this thesis.

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CHAPTER I: INTRODUCTION

The old saying "Sell in May and go away" advises the investors to leave the market in May and come back after September. Is this just a saying or can investors actually benefit from this market timing strategy?

In efficient markets, rational investors should take advantage of any known mispricing and any observed anomaly should quickly disappear. The anomaly known as the Sell in May Effect has been known for a long time. There has even been a comprehensive study of this anomaly by Bouman and Jacobsen published in 2002. It is therefore the puzzling that the recent out-of-sample study of Andrade *et al.* (2013) found evidence of the continuing existence of the Sell in May Effect.

My thesis provides another yet more comprehensive study of the Sell in May Effect. I examine the Sell in May Effect in 70 markets and evaluate this effect separately for different types of markets and regions. I follow the methodology of Bouman and Jacobsen (2002) and Andrade *et al.* (2013). Bouman and Jacobsen found evidence of the Sell in May Effect in 37 countries in the time period before 1998. Andrade *et al.* (2013) examined the same sample of countries in the following time period 1998 to 2012. The sample of countries used in these two studies were 23 developed, 12 emerging and 2 frontier markets for which Morgan Stanley Capital International (MSCI) indices existed for an extended time period. In my thesis, I expand the study to 70 countries consisting of 24 developed, 21 emerging and 25 frontier markets. I examine separately developed, emerging and frontier markets. I find evidence of the Sell in May effect in all of these markets. The strongest Sell in May Effect is in the emerging markets, averaging 11.07%. It means that investors in emerging markets earn on average 11.07% higher

returns during the November-to-April period compared to the May-to-October period. For developed countries the Sell in May Effect is on average 8.76%. The Sell in May Effect in frontier markets averages 5.45% but is usually not significant on a country-by-country level. This finding is due to generally high volatility of returns in frontier markets.

The possible rational explanations of many seasonal anomalies are based on transaction costs, differences in level of risks and data mining. None of these explanations are, however, satisfactory for the explanation of the Sell in May Effect. The non-frequent trading (only twice per year) necessary for the Sell in May Effect as well as the size of the effect (8.89% average across all markets) eliminate the explanation based on the transaction costs. The data mining explanation is also unlikely since the effect has been confirmed in out-of-sample studies. Could the effect be attributed to the differences in market risk during the winter and summer months? In my sample, the standard deviation of returns for the time period November-to-April is smaller than that of the time period May-to-October indicating that the market risks of the time period November-to-April is lower than those of the time period May-to-October. Therefore, the Sell in May Effect cannot be explained as a reward of investors for taking higher risk during the winter months.

The thesis is organized as follows. Chapter II provides a literature review of the Sell in May Effect and discusses the differences among the developed, emerging and frontier markets. Chapter III describes the methodology and data used in this study. Results are presented in Chapter IV. Chapter V summarizes the conclusions.

CHAPTER II: LITERATURE REVIEW

2.1. Efficient market hypothesis and market anomalies

The efficient market hypothesis states that all relevant information is incorporated into stock prices. Many papers have been devoted to study of markets efficiency. Many of them support the notion that the stock markets are at least weak-form efficient meaning that the stock prices reflect all past information about their prices and trading volume (Kendall, 1953, Roberts, 1959, Alexander, 1961, Fama and Blume, 1966). On the other hand, there are numerous studies pointing to apparent market anomalies. The existence of market anomalies is not consistent with the efficient market hypothesis.

Many anomalies can be characterized as "seasonal" anomalies. These types of anomalies report evidence of abnormal returns associated with trading strategies based on some calendar period. Some of these trading rules are related, for example, to day-of-the-week, the week-of-the-month, month-of-the-year, turn-of-the-year or holidays.

The Monday effect is an example of the day-of-the-week anomaly. It states that returns on the stock market on Mondays follow the trend from the previous Friday. It means that if the market was up on Friday, according to the Monday effect, the stock market will continue to go up also on Monday. The Monday effect was first documented by French (1980). After that, many researchers confirmed the Monday effect using different time periods and different stock indices. For example, Jaffe *et al.* (1989) found that the Monday effect exists not only in the U.S. markets, but also in the foreign stock markets. Flannery and Protopapadakis (1988) found that the Monday effect exists also across different types of securities.

The turn-of-the-month effect states that the returns on the last day of the month and the first three days of the following month are higher than the returns on the remaining days of the month. Kunkel *et al.* (2003) examined the daily closing prices from stock market indices of 19 countries from August 1, 1988 to July 31, 2000. They found evidence of the turn-of-the-month effect in 16 out of 19 countries during the time period from 1988 to 2000. Cadsby and Radner (1992) examined the turn-of-the-month effect using the daily stock market indices of ten countries from 1962 to 1989. They found evidence of the-turn-of-the-month effect in six of these ten countries.

Another highly discussed effect is the holiday effect. Merrill (1966) found the unusual increase of the Dow Jones Industrial Average index on the trading day before the holidays from 1897 to 1965. Ariel (1990) studied the returns of the CRSP value-weighted and equal-weighted index from 1963 to 1982. He found that the average returns on the trading day before holiday averages nine to fourteen times higher than on non-preholiday trading days.

The January effect states that the stock prices tend to rise more in the month of January than in any other month. Wachtel (1942) studied the seasonal movement of the U.S. stock market and found the existence of the January effect of the U.S. markets. In his paper, he hypothesized that this effect is a result of tax considerations of investors. Roll (1983) and Reinganum (1983) examined the January effect on the U.S. markets and found support for the tax selling explanation of January effect. There are, however, also studies that do not support the tax explanation of January effect. For example, Kato and Schallheim (1985) found evidence of the January effect in Japanese stock markets. The January effect existed without capital gains tax or loss offsets. Berges, McGonnell, and Schlarbaum(1984) found evidence of a January effect in Canadian stock markets before 1972 although there was no capital gains tax before 1972.

The possibility of finding market anomalies has been fascinating to both investors and researchers. The criticism of market anomalies points to two main issues. First, these strategies may be statistically but not economically significant. After the adjustment for trading costs, many of these anomalies disappear. Second, the abnormal returns associated with these strategies can be a result of data mining and will not be significant in the out-of-sample tests. For example the day-of-the-week effect has disappeared in the U.S. (Dubois and Louvet, 1996) and is inconsistent across countries (Agrawal and Tandon, 1994) and over time (Wang *et al*., 1997). The turn-of-the month effect and turn-of-the-year effect changed over time and cannot be used to make abnormal profits (Hensel *et al*., 2000, Booth and Keim, 2000). Sullivan *et al*. (2001) carried out a comprehensive study on 100 years of daily data and concluded that "*although nominal p-values for individual calendar rules are extremely significant, once evaluated in context of full universe from which such rules were drawn, calendar effects no longer remain significant.*"

Conclusive evidence on seasonal anomalies, however, is still lacking. One of the more feasible explanations for these kinds of market anomalies, those that cannot be explained by different risk factors or certain frictions in the markets, is the "clientele effect". Ritter (1988) and Harris and Gurel (1986) suggested that seasonal anomalies can be induced by behaviorally induced investment decisions of investors. In other words, some investors may just prefer to buy (or avoids selling) on pre-holidays, in certain months, or week days.

2.2. Sell in May Effect

The Sell in May Effect is a "seasonal anomaly" based on the old saying that advises investors to sell in May and do not return into the markets until after November. Along with other market anomalies, such as the Monday effect, the turn of the month effect, and the January effect, the Sell in May Effect represents a challenge to the efficient market hypothesis. In contrast to other market anomalies, the Sell in May Effect is minimally affected by transaction costs. For example, an investor has to trade 12 times a year to get the full benefit of the turn of the month effect and 52 times a year for the Monday effect. In contrast, it takes only two times a year to trade to exploit the Sell in May Effect.

The first comprehensive study of the Sell in May Effect was published by Bouman and Jacobsen (2002). They analyzed 37 countries over the time period up to 1998. They found that 36 out of the total 37 countries exhibit the Sell in May Effect, for 20 of these countries the effect is significant at least at the 10 % level. The sample of Bouman and Jacobsen (2002) included 23 developed, 12 emerging and 2 frontier markets. Bouman and Jacobsen (2002) discuss many factors that could possibly serve as an explanation of the Sell in May Effect, such as the January Effect, the cross correlation between different markets, the differences in market risk between the summer and winter months, the transaction costs, and data mining. They, however, do not find any evidence that any of these factors could provide a feasible explanation for this seasonal anomaly.

Andrade *et al*. (2013) perform an out-of-sample study of the Sell in May Effect closely following the methodology of Bouman and Jacobsen (2002). They use the same countries and MSCI indices from 1998 to 2012. They find that the Sell in May Effect still not only persists, but

also has similar magnitude compared with the sample of Bouman and Jacobsen (2002). Since their study represents an out-of-sample study of the Sell-in-May Effect, it strongly weakens the data mining explanation of the effect. The estimates of the Sell in May effect in the sample of Bouman and Jacobsen (2002) range from 8.38% to 8.71%, while in the sample of Andrade *et al.* (2013), from 9.22% to 9.74%.

2.3. Developed markets

The developed markets or developed countries typically refer to countries with a relatively high level of economic growth and security (table 1). The main criteria for evaluating the country's economic development are GDP, level of industrialization, level of infrastructure, development of capital markets, standard of living and level of education. Some of the classification criteria used for classification of the markets to developed, emerging and frontier markets can be found in table 2. Classification of the market is provided by several investment groups and rating agencies, such as FTSE, MSCI, Dow Jones, Russell Global and S&P (table 1). The classifications of different agencies are broadly similar in large but they can differ for some countries. For example FTSE and S&P refer to Korea as developed markets while MSCI, Dow Jones, and Russell Global as emerging markets. Table 1 provides comparison of classification by different agencies for developed markets.

For the purpose of this thesis, I use the MSCI classification system. This is mainly for two reasons. First, the MSCI classification is well recognized by the industry and academics. It is to a large extent consistent with the classification of other leading agencies. Second, I use the MSCI total return indices for examining the Sell in May Effect. Table 2 shows the MSCI criteria for the classification of different markets.

Table 1: List of developed markets as classified by different agencies

Countries	FTSE	MSCI	Standard & Poor's	Dow-Jones	Russell Global
Panel A: Americas					
Canada	√	√	√	√	√
United States	√	√	√	√	√
Panel B: Europe & Middle East					
Austria	√	√	√	√	√
Belgium	√	√	√	√	√
Denmark	√	√	√	√	√
Finland	√	√	√	√	√
France	√	√	√	√	√
Germany	√	√	√	√	√
Greece*	√	√	√	√	√
Iceland				√	
Ireland	√	√	√	√	√
Israel	√	√	√	√	√
Italy	√	√	√	√	√
Luxemburg	√		√	√	√
Netherlands	√	√	√	√	√
Norway	√	√	√	√	√
Portugal	√	√	√	√	√
Spain	√	√	√	√	√
Sweden	√	√	√	√	√
Switzerland	√	√	√	√	√
United Kingdom	√	√	√	√	√
Panel C: Pacific					
Australia	√	√	√	√	√
Hong Kong	√	√	√	√	√
Japan	√	√	√	√	√
Korea	√		√		
New Zealand	√	√	√	√	√
Singapore	√	√	√	√	√

Table 1 provides classifications for developed markets provided by different agencies. For my thesis, I use the MSCI classification system.

* Greece will be reclassified as emerging markets in November 2013.

Table 2: Criteria for classifications of the markets

Criteria	Developed Markets	Emerging Markets	Frontier Markets
A. Economic Development			
A.1 Sustainability of economic development	Country GNI per capita 25% above the World Bank high income threshold for 3 consecutive years	No requirement	No requirement
B. Size and Liquidity Requirements			
B.1 Number of companies meeting the following Standard Index criteria	5	3	2
Company size (full market cap)	USD 2065 mm	USD 1032 mm	USD 516 mm
Security size (float market cap)	USD 1032 mm	USD 516 mm	USD 37 mm
Security liquidity	20% ATVR	15% ATVR	2.5% ATVR
C. Market Accessibility Criteria			
C.1 Openness to foreign ownership	Very high	Significant	At least some
C.2 Ease of capital inflows / outflows	Very high	Significant	At least partial
C.3 Efficiency of the operational framework	Very high	Good and tested	Modest
C.4 Stability of the institutional framework	Very high	Modest	Modest

Table 2 provides the criterion for the classifications of different markets. Their criteria include three parts: Economic Development, Size and Liquidity requirement, and Market Accessibility.

2.4. Emerging markets

The list of the emerging countries by major agencies is provided in table 3. Emerging markets are characterized by rapid growth in social and business activity and in industrialization. Also, emerging market countries usually have transitions from dictatorships to free-market-oriented-economies, such as Egypt, Chile. These countries have increasing economic freedom and gradual integration with the Global Marketplace and other members of the GEM (Global Emerging Market). In addition, emerging markets are experiencing expanding middle classes, improving standards of living, social stability and tolerance, as well as an increase in cooperation with multilateral institutions.

2.5. Frontier markets

Frontier markets have similar characteristics as emerging markets but have smaller market capitalization and liquidity. The frontier markets are expected to become more liquid and exhibit similar risk and return characteristics as emerging markets as they develop. The term frontier market was first used by Farida Khambata, a leader of Emerging Market Database (EMDB) project of International Finance Corporation (IFC). The IFC has published data on smaller markets since 1992.

Frontier markets can be further divided into three groups:

1. Small countries with relatively high development level (such as Estonia) that are too small to be considered as the emerging market.
2. Countries with strict investment restrictions that are beginning to loosen (such as the Middle East countries).

3. Countries with development level lower than the “traditional” emerging market (such as Argentina or Vietnam).

The list of frontier markets as classified by different agencies is provided in table 4.

Table 3: List of emerging markets as classified by different agencies

Countries	FTSE	MSCI	Standard & Poor's	Dow-Jones	Russell Global
Panel A: Americas					
Brazil	√	√	√	√	√
Chile	√	√	√	√	√
Colombia	√	√	√	√	√
Mexico	√	√	√	√	√
Peru	√	√	√	√	√
Panel B: Euro, Middle East & Africa					
Czech Republic	√	√	√	√	√
Egypt	√	√	√	√	√
Hungary	√	√	√	√	√
Latvia					√
Morocco*	√	√	√	√	√
Poland	√	√	√	√	√
Russia	√	√	√	√	√
South Africa	√	√	√	√	√
Turkey	√	√	√	√	√
United Arab Emirates	√				√
Panel C: Asia					
China	√	√	√	√	√
India	√	√	√	√	√
Indonesia	√	√	√	√	√
Korea**		√		√	√
Malaysia	√	√	√	√	√
Pakistan	√				
Philippines	√	√	√	√	√
Taiwan**	√	√	√	√	√
Thailand	√	√	√	√	√

Table 3 provides classifications for emerging markets provided by different agencies. For my thesis, I use the MSCI classification system.

* Morocco will be reclassified as frontier markets in November 2013.

**Korea and Taiwan are currently under review for a potential reclassification to developed markets in 2014.

Table 4: List of frontier markets as classified by different agencies

Countries	FTSE	MSCI	Standard & Poor's	Dow-Jones	Russell Global
Panel A: Americas					
Argentina	√	√	√	√	√
Ecuador			√		
Jamaica			√		√
Panama			√		
Trinidad and Tobago			√		√
Panel B: Euro & CIS					
Bosnia and Herzegovina					√
Bulgaria	√	√	√	√	√
Croatia	√	√	√	√	√
Cyprus	√		√	√	√
Estonia	√	√	√	√	√
Kazakhstan		√	√	√	√
Kyrgyzstan					√
Latvia			√	√	
Lithuania	√	√	√	√	√
Macedonia	√			√	√
Malta	√			√	√
Romania	√	√	√	√	√
Serbia	√	√		√	√
Slovakia	√		√	√	√
Slovenia	√	√	√	√	√
Ukraine		√	√	√	√
Panel C: Africa					
Botswana	√		√		√
Côte d'Ivoire	√		√		
Gabon					√

Table 4 provides classifications for emerging markets provided by different agencies. For my thesis, I use the MSCI classification system.

Table 4: List of frontier markets as classified by different agencies (continued)

Countries	FTSE	MSCI	Standard & Poor's	Dow-Jones	Russell Global
Panel C: Africa					
Ghana	√		√		√
Kenya	√	√	√	√	√
Mauritius	√	√	√	√	√
Namibia			√		√
Nigeria	√	√	√	√	√
Senegal					√
Tanzania					√
Tunisia	√	√	√	√	√
Zambia			√		√
Panel D: Middle East					
Bahrain	√	√	√	√	√
Jordan	√	√	√	√	√
Kuwait		√	√	√	√
Lebanon		√	√	√	
Oman	√	√	√	√	√
Qatar*	√	√	√	√	√
United Arab Emirates*		√	√	√	
Panel E: Asia					
Bangladesh	√	√	√	√	√
Pakistan		√	√	√	√
Papua New Guinea					√
Sri Lanka	√	√	√	√	√
Vietnam	√	√	√	√	√

Table 4 provides classifications for frontier markets provided by different agencies. For my thesis, I use the MSCI classification system.

* Qatar and United Arab Emirates will be reclassified as emerging market in May 2014.

CHAPTER III: METHODOLOGY

3.1 Data

All data for this study are obtained from the Bloomberg database. The data consists of total returns on the MSCI stock markets indices for 70 countries. The total returns are calculated based on the indices denominated in local currencies and span the time period from 1991 to 2013. For countries that the MSCI indices could not be accessed through the Bloomberg database, I use the total returns on the local stock market indices denominated in local currency. Tables 5, 6 and 7 show the complete list of developed, emerging and frontier markets used in this study together with the time period and the name of the indices. In addition, tables 5, 6 and 7 also show the countries and time period used by Bouman and Jacobsen (2002) and Andrade *et al*. (2013). Bouman and Jacobsen (2002) used the MSCI indices of 37 countries from 1970 to1998 and Andrade *et al*. (2013) used the same sample of 37 countries from 1998 to 2012.

In comparison to the study of Bouman and Jacobsen (2002) and the study of Andrade *et al*. (2013), the sample used in this study is very large and well represents all three types of the markets: developed (24 countries), emerging (21 countries) as well as frontier markets (25 countries). While almost all developed countries were included in previous studies, emerging markets and especially the frontier markets were not well represented in these studies.

Twenty five countries in my sample have data for time period starting at 1991. Twelve of these countries are developed markets (Canada, United States, Denmark, Norway, Sweden, Switzerland, United Kingdom, Australia, Hong Kong, Japan, New Zealand and Singapore). With exception of Hong

Kong[1], I use MSCI indices for all of these countries. Eleven are emerging markets (Brazil, Chile, Mexico, Hungary, Turkey, Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand) and two are frontier markets (Argentina, Jordan). Among these countries only Hungary uses its local Budapest stock market index.

Stock market indices for other countries start after 1991. This includes countries that had MSCI indices established after 1991 even so their local markets existed and also countries with newly established stock markets such as countries of Eastern European block and China.

In addition to the indices on individual countries, I also use the MSCI World index and the MSCI ACWI index. The MSCI World index includes only developed countries. The MSCI ACWI index includes both developed and emerging markets. Both of these indices are value-weighted indices and are denominated in the U.S. dollar.

3.2 Variables

In this study, I use methodology of Bouman and Jacobsen (2002) and Andrade *et al* (2013). I calculate the total returns for the May-to-October period and the November-to-April period. I refer to these periods as summer (May-to-October) and winter (November-to-April) semesters. The total return of the winter semester is calculated as the total return from the last trading day of October (the closing price) to the last trading day of April. Similarly, the total return on the summer semester is calculated as total return from the last trading day of April (the closing price) and the last trading day of October (the closing price).

[1] Heng Seng is the local stock market index in Hong Kong.

3.3 Regressions

In order to examine the existence of the Sell in May Effect, I use the same regression approach as in Bouman and Jacobsen (2002) and Andrade *et al.* (2013):

$$r_{i,t} = \mu_i + \alpha_i S_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where $r_{i,t}$ is the return on the stock index for country i of semester t, μ_i is the intercept for country i, α_i is the estimated coefficient of the Sell in May Effect and $\varepsilon_{i,t,}$ is the error term. S_t is a dummy variable with value 1 for the November-to-April period and value 0 for the May-to-October period. I test the hypothesis that $\alpha=0$. A positive and significant α indicates sufficient evidence to conclude that there is a Sell in May Effect. I estimate equation (1) using both country-by-country and pooled data.

Table 5: Data description for developed markets

Country	Years	Index	Andrade *et al*. (2013)	Bouman and Jacobsen (2002)
Panel A: Americas				
Canada	1991-2013	MSCI	1998-2012	1970-1998
United States	1991-2013	MSCI	1998-2012	1970-1998
Panel B: Europe & Middle East				
Austria	1995-2013	MSCI	1998-2012	1970-1998
Belgium	1995-2013	MSCI	1998-2012	1970-1998
Denmark	1991-2013	MSCI	1998-2012	1970-1998
Finland	1995-2013	MSCI	1998-2012	1988-1998
France	1995-2013	MSCI	1998-2012	1970-1998
Germany	1995-2013	MSCI	1998-2012	1970-1998
Greece	1999-2013	MSCI	1998-2012	1988-1998
Ireland	1995-2013	MSCI	1998-2012	1988-1998
Israel	1993-2013	MSCI		
Italy	1995-2013	MSCI	1998-2012	1970-1998
Netherlands	1995-2013	MSCI	1998-2012	1970-1998
Norway	1991-2013	MSCI	1998-2012	1970-1998
Portugal	1995-2013	MSCI	1998-2012	1988-1998
Spain	1995-2013	MSCI	1998-2012	1970-1998
Sweden	1991-2013	MSCI	1998-2012	1970-1998
Switzerland	1991-2013	MSCI	1998-2012	1970-1998
United Kingdom	1991-2013	FTSE	1998-2012	1970-1998
Panel C: Pacific				
Australia	1991-2013	MSCI	1998-2012	1970-1998
Hong Kong	1991-2013	Heng Seng	1998-2012	1970-1998
Japan	1991-2013	MSCI	1998-2012	1970-1998
New Zealand	1991-2013	MSCI	1998-2012	1988-1998
Singapore	1991-2013	MSCI	1998-2012	1970-1998

This table shows the samples of countries, indices, and time periods used in my thesis for developed markets, in comparison to the samples of countries and time periods used in Andrade *et al* (2013) and Bouman and Jacobsen (2002).

Table 6: Data description for emerging markets

Country	Years	Index	Andrade *et al*. (2013)	Bouman and Jacobsen (2002)
Panel A: Americas				
Brazil	1991-2013	MSCI	1998-2012	1990-1998
Chile	1991-2013	MSCI	1998-2012	1988-1998
Colombia	1993-2013	MSCI		
Mexico	1991-2013	MSCI	1998-2012	1988-1998
Peru	1993-2013	MSCI		
Panel B: Euro, Middle East & Africa				
Czech	1994-2013	Prague Index		
Egypt	1995-2013	MSCI		
Hungary	1991-2013	Budapest Index		
Morocco	1995-2013	MSCI		
Poland	1993-2013	MSCI		
Russia	1995-2013	MSCI	1998-2012	1995-1998
South Africa	1993-2013	MSCI	1998-2012	1993-1998
Turkey	1991-2013	MSCI	1998-2012	1988-1998
Panel C: Asia				
China	2001-2013	MSCI		
India	1993-2013	MSCI		
Indonesia	1991-2013	MSCI	1998-2012	1988-1998
Korea	1991-2013	MSCI	1998-2012	1988-1998
Malaysia	1991-2013	MSCI	1998-2012	1988-1998
Philippines	1991-2013	MSCI	1998-2012	1988-1998
Taiwan	1991-2013	MSCI	1998-2012	1988-1998
Thailand	1991-2013	MSCI	1998-2012	1988-1998

This table shows the samples of countries, indices, and time periods used in my thesis for emerging markets, in comparison to the samples of countries and time periods used in Andrade *et al* (2013) and Bouman and Jacobsen (2002).

Table 7: Data description for frontier markets

Country	Years	Index	Andrade *et al*. (2013)	Bouman and Jacobsen (2002)
Panel A: Americas				
Argentina	1991-2013	MSCI	1998-2012	1988-1998
Panel B: Europe & CIS				
Bulgaria	2006-2013	MSCI		
Croatia	2003-2013	Crobex Index		
Estonia	1998-2013	Tallinn Index		
Kazakhstan	2001-2013	Kazakhstan Stock Index		
Lithuania	2009-2013	MSCI		
Romania	1998-2013	Bucharest Index		
Serbia	2009-2013	MSCI		
Slovenia	2003-2013	MSCI		
Ukraine	2007-2013	MSCI		
Panel C: Africa				
Kenya	2003-2013	MSCI		
Mauritius	2003-2013	MSCI		
Nigeria	2003-2013	MSCI		
Tunisia	2009-2013	MSCI		
Panel D: Middle East				
Bahrain	2006-2013	MSCI		
Jordan	1991-2013	MSCI	1998-2012	1988-1998
Kuwait	2006-2013	MSCI		
Lebanon	2005-2013	MSCI		
Oman	2006-2013	MSCI		
Qatar	2006-2013	MSCI		
United Arab Emirates	2006-2013	MSCI		
Panel E: Asia				
Bangladesh	2010-2013	MSCI		
Pakistan	1993-2013	MSCI		
Sri Lanka	1993-2013	MSCI		
Vietnam	2007-2013	MSCI		

This table shows the samples of countries, indices, and time periods used in my thesis for frontier markets, in comparison to the samples of countries and time periods used in Andrade *et al* (2013) and Bouman and Jacobsen (2002).

CHAPTER IV: RESULTS AND DISCUSSION

The country-by-country results for the Sell in May Effect are presented in tables 8, 9, 10, 12, 13 and 14 and figures 1, 2 and 3. Tables 8, 9 and 10 show the mean returns for May-to-October and November-to-April semesters and the mean Sell in May Effect for each country. Tables 12, 13, and 14 provide the same results but estimated by regressions according to the equation (1).

The results for pooled data are summarized in tables 11 and 15. In the following paragraphs, I will discuss these results separately for different types of the markets and for the pooled data.

4.1. Developed markets

Table 8 shows the mean returns and the standard deviations for May-to-October and November-to-April semesters for developed countries. Within the table, the countries are separated according to their geographic location.

I find that for 23 out of 24 developed countries the mean returns for winter semesters, i.e. November-to-April, are higher than the mean returns for summer semesters, i.e. May-to-October. The average mean return across all developed countries during the winter semester is 9.22% compared to 0.46% for the summer semester. The mean Sell-in-May Effect thus represents 8.76% meaning that the investors earn on average 8.76% more during the winter holding periods compared to summer holding periods. The Sell in May Effect is statistically significant at least at the 10% level for 16 countries. Countries with largest Sell in May Effect are European countries such as Ireland (17.80%), Sweden (15.52%), Finland (15.33%), Austria (14.41%), Italy (11.89%) and Germany (11.83%).

The only region for which the mean winter semester return was lower than the mean summer semester return is Hong Kong. This difference, however, is not significantly different from zero.

One potential rational explanation of Sell in May Effect is that the markets are riskier during the winter than summer semesters. Therefore, I also examined the standard deviation of returns for winter and summer semesters. The average standard deviation is 15.73 for winter and 17.28 for summer semesters. This finding does not support the hypothesis that Sell in May Effect could be explained based on different market risk for winter and summer semester.

4.2. Emerging markets

Table 9 displays the mean returns and standard deviations for the May-to-October and November-to-April semesters for the frontier markets. The average return for winter semester is 15.44% compared to 4.38% for summer semester. The Sell in May Effect is present for 20 out of the 21 emerging markets. On average, the difference between the mean returns during the winter and summer semesters, i.e. the Sell in May Effect, is 11.07%. The countries with largest Sell in May Effect are Turkey (24.98%), Russia (23.85%), China (19.52%), Taiwan (16.38%), Colombia (15.67%) and Korea (15.46%). Although the Sell in May Effect is on average stronger for emerging compared to developed countries, it is significant only for 8 countries. The average standard deviation of returns for emerging markets is 29.73 compared to 17.09 for developed markets.

The average standard deviation of returns for winter semesters is 26.91 and 31.38 for summer semesters. Therefore, similar to developed countries, the volatility of the market cannot be claimed as a reason for the existence of the Sell in May Effect.

The only country from emerging markets that does not appear to have the Sell in May Effect is Poland with negative difference between the winter and summer semester returns. The difference, however, is not significantly different from zero.

4.3. Frontier markets

Table 10 summarizes the results for the Sell in May Effect for frontier markets. Out of 25 frontier markets, 15 markets show the Sell in May Effect but this effect is significant only for one of these markets: Estonia. What are possible reasons for weak evidence of the Sell in May Effect on country by country level in frontier markets? First, frontier markets can be seen as less developed emerging markets. The volatility of returns in frontier markets is high. In my sample the average standard deviation is 33.19. It is higher than the standard deviation of returns for developed (17.09) or emerging (29.73) markets. Second, the returns of frontier markets have low correlation with other markets. Therefore, frontier markets may show different behavior than developed or emerging markets.

4.4. Pooled data

Table 11 presents the results of the average returns and standard deviations for pooled data. Panel A gives the average returns, standard deviations and the Sell in May Effect for my whole sample (all countries), and then separately for developed, emerging and frontier markets. Each country is represented equally. It means that these results represent returns on equally-weighted indices. Several important observations can be made. First, the Sell in May Effect is significant for all types of markets. Second, the mean Sell in May Effect for all countries is 8.89%. It means that on average, investors would have earned 8.89% higher returns during November-to-April period than during the May-to-September period across all countries. Third, the strongest Sell in May Effect is found in emerging markets (11.07%).

Panel B of table 11 shows the returns, standard deviations and the Sell in May using the MSCI World and MSCI ACWI indices. There are two important differences between panel A and panel B. First, MSCI World and MSCI ACWI are value-weighted indices while the setup in panel A is to

represent the equal-weighted indices. For investors that diversify across countries based on the capitalization of their markets, value-weighted indices give better estimates of returns. Second, the MSCI World and MSCI ACWI are denominated in the U.S. dollar, not the local currencies. Therefore their returns will not be affected by the exchange rates between the local currencies and U.S. dollar. For U.S. investors they represent more accurate estimate of returns.

The MSCI World index includes only developed countries. The MSCI ACWI index includes both developed and emerging markets. For both indices, the mean returns for winter semesters are higher than for summer semesters. The estimated Sell in May Effect using MSCI World index is 6.13% and 6.25% for MSCI ACWI index. Both are significant at the 10% level. For both indices the standard deviations of returns are higher for summer (12.80 for MSCI World and 13.43 for MSCI ACWI) than winter (8.73 for MSCI World and 8.53 for MSCI ACWI) periods confirming the finding that the Sell in May Effect is not a result of higher risk of the markets during the winter semesters.

Table 8: The average returns for winter and summer semesters for developed markets

Country	Number of periods	Average Return			Sell in May Effect	t-stat	Standard deviation		
		Annual	May to October	November to April			Annual	May to October	November to April
Panel A: Americas									
Canada	44	4.82	2.02	7.61	5.59	1.63	11.62	12.22	10.53
United States	44	4.82	2.03	7.61	5.58	**1.75**	10.82	11.43	9.64
Panel B: Europe & Middle East									
Austria	36	3.82	-3.39	11.02	14.41	**2.44**	18.93	21.82	12.30
Belgium	36	5.05	1.70	8.39	6.69	1.18	17.06	20.10	13.11
Denmark	44	6.35	1.82	10.88	9.06	**1.99**	15.64	16.69	13.41
Finland	36	7.85	0.18	15.52	15.33	**1.64**	28.64	19.95	34.15
France	36	4.94	-0.20	10.08	10.28	**2.11**	15.34	14.45	14.84
Germany	36	5.40	-0.52	11.31	11.83	**2.28**	16.46	16.73	14.28
Greece	28	-2.97	-3.58	-2.36	1.22	0.13	23.88	28.45	19.34
Ireland	36	2.31	-6.59	11.21	17.80	**2.98**	19.85	17.87	18.02
Israel	40	3.95	-0.89	8.80	9.69	**1.85**	17.10	15.54	17.58
Italy	36	3.35	-2.59	9.29	11.89	**2.22**	16.94	15.80	16.31
Netherlands	36	5.11	0.34	9.87	9.53	**1.83**	16.12	17.27	13.73
Norway	44	5.73	0.73	10.73	10.00	**1.98**	17.32	21.31	10.37
Portugal	36	4.56	-0.91	10.03	10.94	**1.78**	19.02	16.76	20.02
Spain	36	6.75	2.36	11.13	8.77	1.42	18.73	17.26	19.59
Sweden	44	7.97	0.21	15.72	15.52	**2.59**	21.13	19.96	19.75
Switzerland	44	5.43	1.85	9.00	7.16	**1.80**	13.52	13.97	12.33
United Kingdom	44	4.48	1.81	7.16	5.35	**1.80**	10.11	11.47	7.92
Panel C: Asia									
Australia	44	5.63	3.36	7.91	4.55	1.43	10.67	11.92	8.95
Hong Kong	44	7.52	8.32	6.72	-1.60	0.28	18.89	23.75	12.85
Japan	44	1.04	-4.44	6.52	10.96	**2.12**	17.82	15.73	18.43
New Zealand	44	4.62	2.02	7.23	5.21	1.45	12.07	13.51	10.09
Singapore	44	4.90	1.25	8.55	7.29	1.31	18.65	19.81	17.09

This table shows the average returns and the standard deviations for winter (from November-to-April) period and summer (from May-to-October) period for developed markets. The Sell in May Effect refers to the difference in the returns of the winter period and the summer period.

Table 9: The average returns for winter and summer semesters for emerging markets

Country	Number of periods	Average Return			Sell in May Effect	t-stat	Standard deviation		
		Annual	May to October	November to April			Annual	May to October	November to April
Panel A: Americas									
Brazil	44	12.50	5.70	19.29	13.60	1.51	30.23	35.07	23.34
Chile	44	7.89	5.71	10.07	4.36	0.72	20.00	24.75	14.02
Colombia	40	12.70	4.87	20.54	15.67	**1.73**	29.30	29.29	27.84
Mexico	44	8.50	4.20	12.80	8.60	1.41	20.47	21.83	18.50
Peru	40	12.18	10.27	14.10	3.83	0.47	25.63	31.38	18.88
Panel B: Europe ,Middle East & Africa									
Czech	38	2.93	-1.06	6.92	7.98	1.36	18.32	19.96	16.06
Egypt	36	13.18	6.51	19.85	13.34	1.30	31.17	30.84	30.91
Hungary	44	9.43	4.51	14.35	9.84	1.26	26.15	27.50	24.36
Morocco	36	5.90	-0.33	12.13	12.46	**2.21**	17.84	11.01	21.26
Poland	40	13.56	15.51	11.61	-3.90	0.21	56.95	79.90	16.27
Russia	36	17.15	5.22	29.07	23.85	**1.80**	41.06	38.15	41.41
South Africa	40	8.25	3.75	12.74	9.00	**1.94**	15.19	14.99	14.38
Turkey	44	28.14	15.65	40.63	24.97	**1.66**	50.76	40.41	57.60
Panel C: Asia									
China	24	6.96	-2.80	16.72	19.52	1.25	38.64	28.81	45.65
India	40	8.99	8.40	9.58	1.17	0.16	22.85	27.88	17.13
Indonesia	44	10.32	3.17	17.48	14.31	**1.64**	29.58	29.27	28.77
Korea	44	7.10	-0.63	14.83	15.46	**2.06**	25.80	21.69	27.70
Malaysia	44	5.91	1.21	10.61	9.41	1.49	21.20	20.69	21.13
Philippines	44	6.69	3.14	10.24	7.10	1.14	20.67	23.32	17.46
Taiwan	44	3.62	-4.57	11.81	16.38	**2.79**	20.96	21.71	16.98
Thailand	44	5.66	1.07	10.25	9.18	1.26	24.28	28.50	18.72

This table shows the average returns and the standard deviations for winter (from November-to-April) period and summer (from May-to-October) period for emerging markets. The Sell in May Effect refers to the difference in the returns of the winter period and the summer period.

Table 10: The average returns for winter and summer semesters for frontier markets

Country	Number of periods	Average Return			Sell in May Effect	t-stat	Standard deviation		
		Annual	May to October	November to April			Annual	May to October	November to April
Panel A: Americas									
Argentina	44	9.14	7.36	10.92	3.56	0.30	39.15	50.10	24.94
Panel B: Europe & CIS									
Bulgaria	14	-6.00	-9.54	-2.46	7.07	0.45	28.55	33.05	25.40
Croatia	20	6.17	4.77	7.58	2.81	0.28	21.78	23.36	21.24
Estonia	30	8.49	-3.62	20.60	24.23	**2.50**	28.80	26.20	26.77
Kazakhstan	24	23.40	5.25	41.55	36.29	1.11	80.48	39.97	105.96
Lithuania	8	13.72	16.03	11.41	-4.61	0.26	23.13	33.06	11.91
Romania	30	12.16	10.11	14.21	4.10	0.37	30.16	37.35	21.92
Serbia	8	12.47	11.04	13.90	2.86	0.12	32.59	46.95	16.39
Slovenia	20	5.08	8.49	1.68	-6.80	0.70	21.36	24.18	18.77
Ukraine	12	-7.13	-22.03	7.77	29.79	1.28	41.53	44.93	35.26
Panel C: Africa									
Kenya	20	31.11	24.31	37.92	13.61	0.59	50.72	32.57	65.32
Mauritius	20	12.45	13.73	11.17	-2.56	0.27	20.86	24.68	17.49
Nigeria	20	10.75	9.09	12.42	3.33	0.28	25.50	28.22	23.88
Tunisia	8	2.84	6.27	-0.60	-6.87	0.84	11.31	9.28	13.45

This table shows the average returns and the standard deviations for winter (from November-to-April) period and summer (from May-to-October) period for frontier markets. The Sell in May Effect refers to the difference in the returns of the winter period and the summer period.

Table 10: The average returns for winter and summer semesters for frontier markets (continued)

Country	Number of periods	Average Return			Sell in May Effect	t-stat	Standard deviation		
		Annual	May to October	November to April			Annual	May to October	November to April
Panel D: Middle East									
Bahrain	14	-6.00	-7.96	-4.04	3.92	0.33	21.59	22.12	22.62
Jordan	44	3.29	-0.27	6.84	7.11	1.31	18.13	14.27	21.04
Kuwait	14	0.93	1.36	0.50	-0.86	0.10	15.68	18.42	13.89
Lebanon	16	6.46	7.33	5.59	-1.75	0.12	27.19	27.99	28.27
Oman	14	3.99	-0.29	8.26	8.55	0.69	22.58	27.69	17.20
Qatar	14	4.94	2.90	6.98	4.08	0.32	23.20	31.67	12.37
United Arab Emirates	14	0.06	1.84	-1.73	-3.57	0.22	29.13	35.56	23.80
Panel E: Asia									
Bangladesh	6	-6.48	0.18	-13.15	-13.33	0.99	16.47	17.57	15.36
Pakistan	40	10.50	4.34	16.66	12.32	1.57	25.28	24.29	25.34
Sri Lanka	40	10.37	16.74	4.01	-12.73	1.33	30.52	38.36	18.85
Vietnam	12	0.21	3.36	-2.95	-6.32	0.38	27.42	32.87	23.45

This table shows the average returns and the standard deviations for winter (from November-to-April) period and summer (from May-to-October) period for frontier markets. The Sell in May Effect refers to the difference in the returns of the winter period and the summer period.

Table 11: The average returns for winter and summer semesters for pooled data

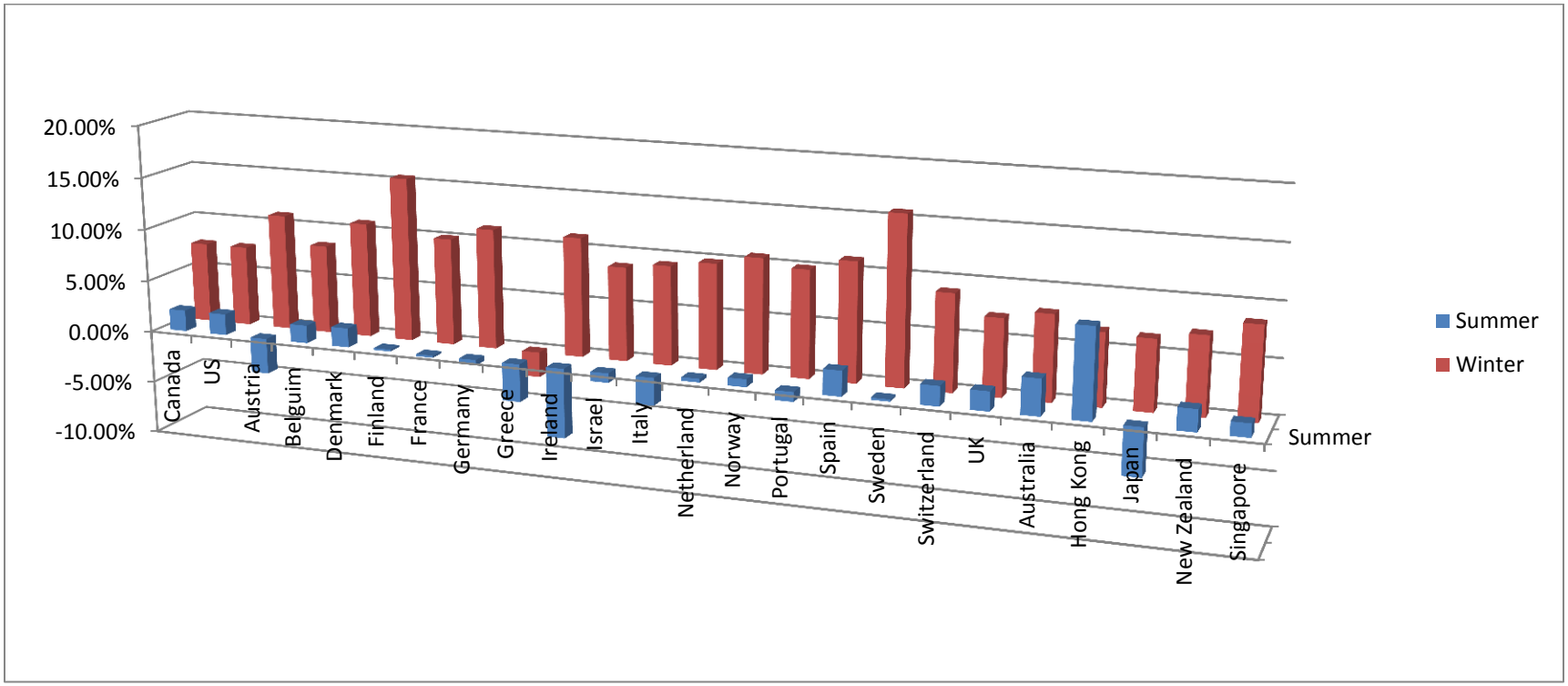
Country	Number of periods	Average Return			Sell in May Effect	t-stat	Standard deviation		
		Annual	May to October	November to April			Annual	May to October	November to April
Panel A: Pooled data									
All countries	2316	7.41	2.96	11.25	8.89	**8.25**	26.30	26.65	25.18
Developed Markets	956	4.84	0.46	9.22	8.76	**8.20**	17.09	17.28	15.73
Emerging Markets	854	9.91	4.38	15.44	11.07	**5.53**	29.73	31.38	26.91
Frontier Markets	506	8.02	5.30	10.74	5.45	**1.85**	33.19	31.79	34.37
Panel B: MSCI World Index									
MSCI World Index*	44	4.12	1.05	7.18	6.13	**1.86**	11.26	12.80	8.73
MSCI ACWI Index*	44	4.20	1.07	7.32	6.25	**1.84**	11.56	13.43	8.53

This table shows the average returns and the standard deviations for winter (from November-to-April) period and summer (from May-to-October) period for pooled data. The Sell in May Effect refers to the difference in the returns of the winter period and the summer period.

*The MSCI World Index captures large and middle cap representation across 24 Developed Markets (DM) countries. With 1,606 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in each country.

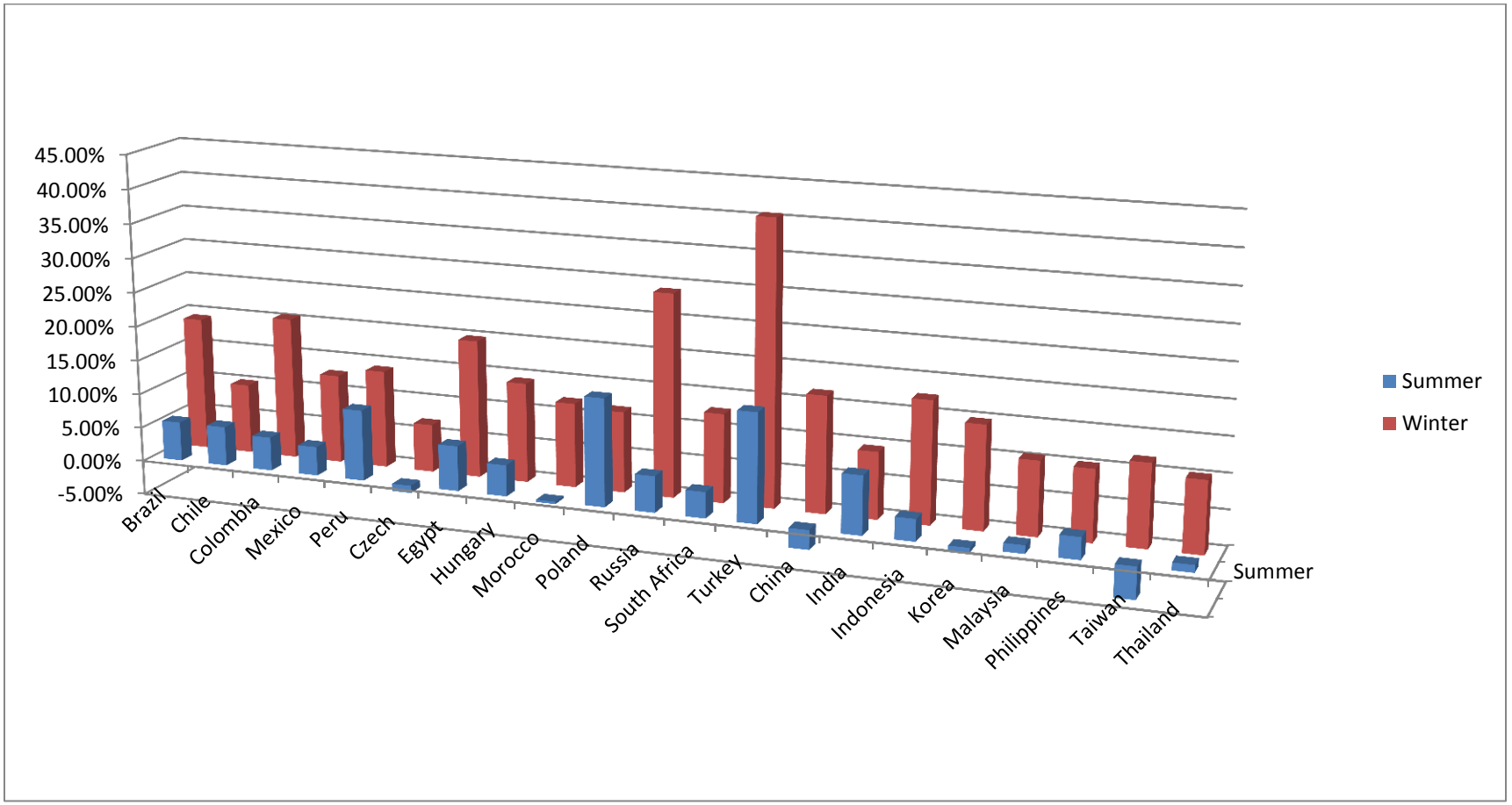
*The MSCI ACWI captures large and middle cap representation across 24 Developed Markets (DM) and 21 Emerging Markets (EM) countries. With 2,424 constituents, the index covers approximately 85% of the global investable equity opportunity set.

Figure 1 Average returns of the May-to-October period and the November-to-April period of developed markets



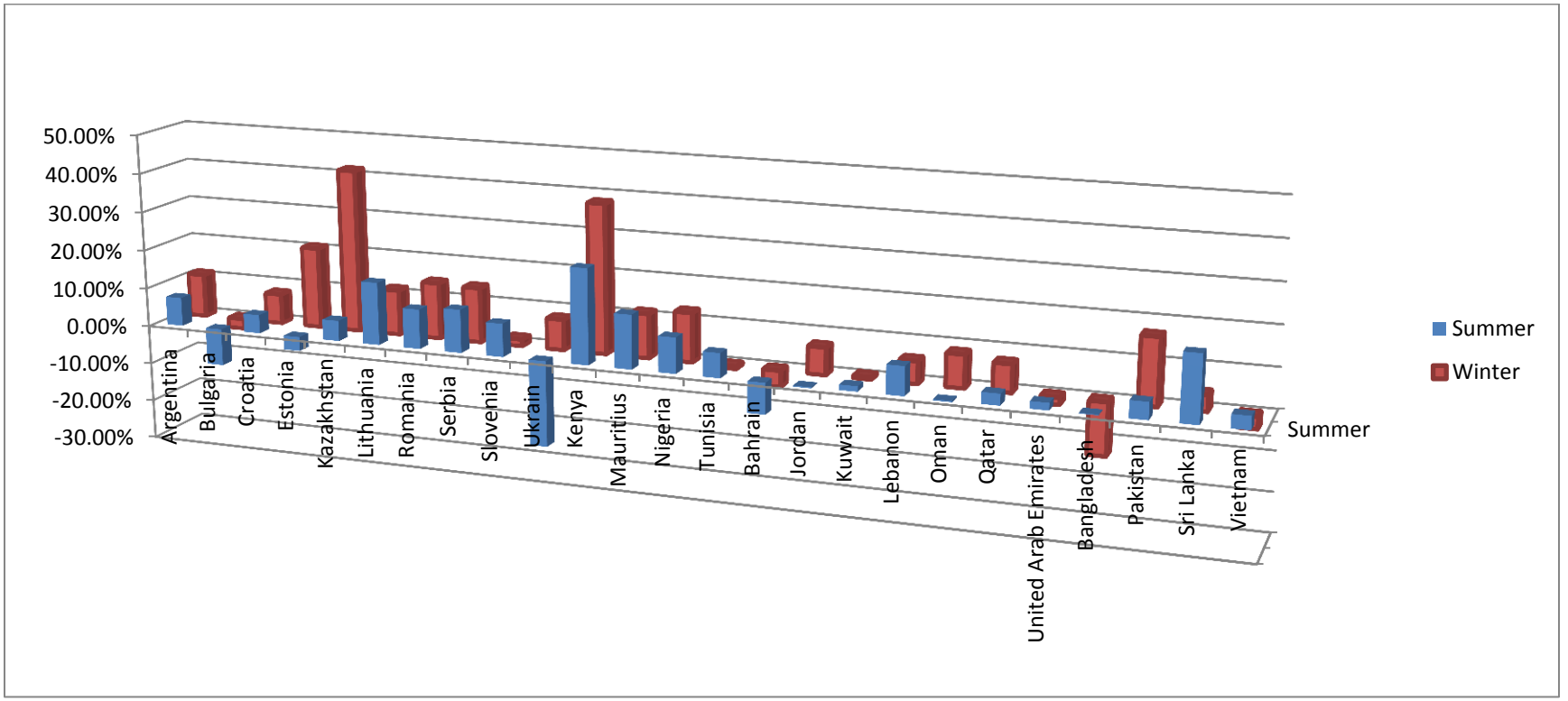
This figure shows the average returns for winter (from November-to-April) period and summer (from May-to-October) period for developed markets. The columns with red color refer to the returns of the winter periods, and the columns with blue color refer to the returns of the summer periods. The Sell in May Effect refers to the difference in the returns of the winter period and the summer period.

Figure 2 Average returns of the May-to-October period and the November-to-April period of emerging markets



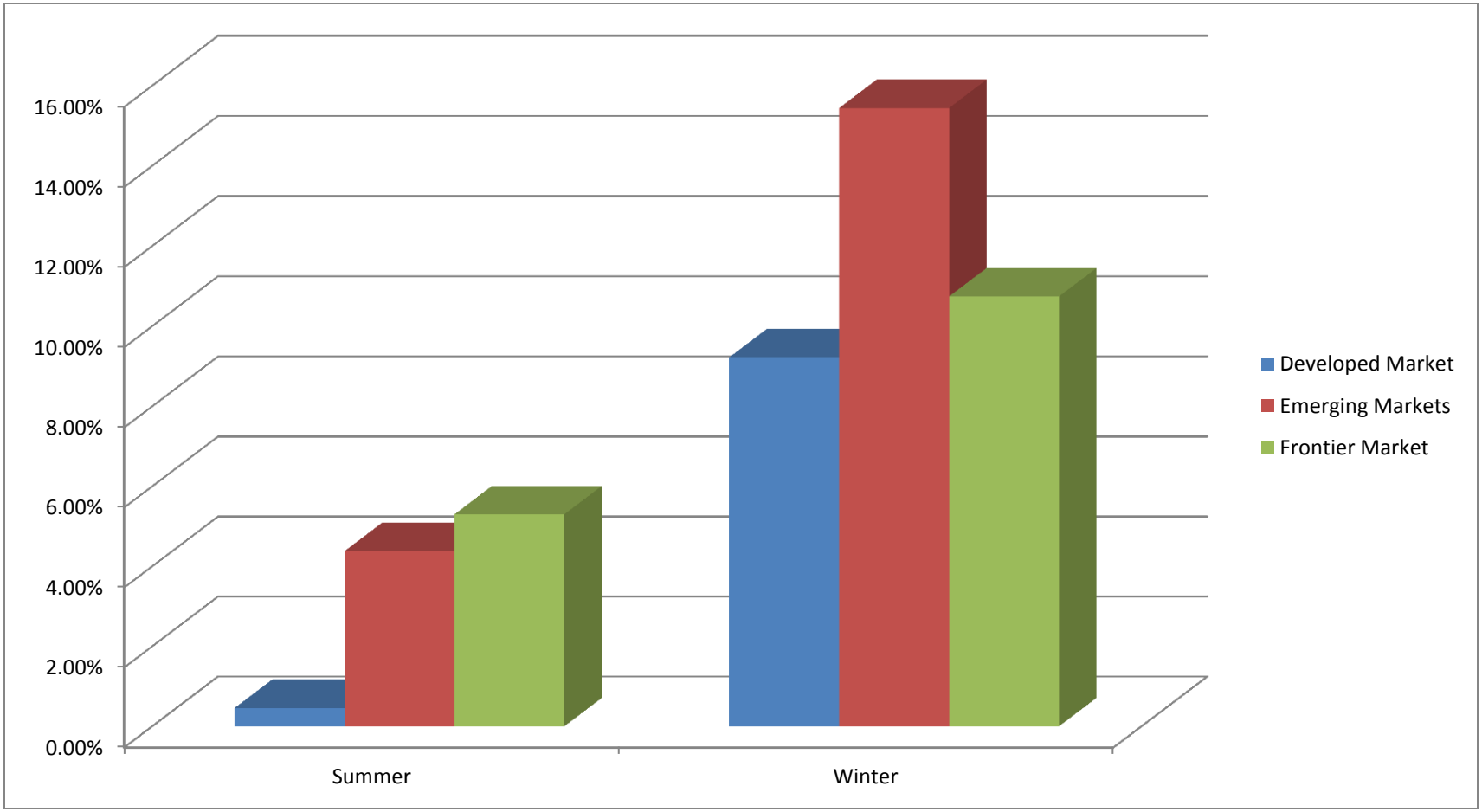
This figure shows the average returns for winter (from November-to-April) period and summer (from May-to-October) period for emerging markets. The columns with red color refer to the returns of the winter periods, and the columns with blue color refer to the returns of the summer periods. The Sell in May Effect refers to the difference in the returns of the winter period and the summer period.

Figure 3 Average returns of the May-to-October period and the November-to-April period of frontier markets



This figure shows the average returns for winter (from November-to-April) period and summer (from May-to-October) period for frontier markets. The columns with red color refer to the returns of the winter periods, and the columns with blue color refer to the returns of the summer periods. The Sell in May Effect refers to the difference in the returns of the winter period and the summer period.

Figure 4 Average returns of the May-to-October period and the November-to-April period of pooled data



This figure shows the average returns for winter (from November-to-April) period and summer (from May-to-October) period for pooled data. The columns with red color refer to the returns of the winter periods, and the columns with blue color refer to the returns of the summer periods. The Sell in May Effect refers to the difference in the returns of the winter period and the summer period.

Table 12: Regression results for developed markets

Country	Number of observations	μ	α	t-stat
Panel A: Americas				
Canada	44	2.02	5.59	1.63
United States	44	2.03	5.58	**1.75**
Panel B: Europe & Middle East				
Austria	36	-3.39	14.41	**2.44**
Belgium	36	1.70	6.69	1.18
Denmark	44	1.82	9.06	**1.99**
Finland	36	0.18	15.33	**1.64**
France	36	-0.20	10.28	**2.11**
Germany	36	-0.52	11.83	**2.28**
Greece	28	-3.58	1.22	0.13
Ireland	36	-6.59	17.80	**2.98**
Israel	40	-0.89	9.69	**1.85**
Italy	36	-2.59	11.89	**2.22**
Netherlands	36	0.34	9.53	**1.83**
Norway	44	0.73	10.00	**1.98**
Portugal	36	-0.91	10.94	**1.78**
Spain	36	2.36	8.77	1.42
Sweden	44	0.21	15.52	**2.59**
Switzerland	44	1.85	7.16	**1.80**
United Kingdom	44	1.81	5.35	**1.80**
Panel C: Pacific				
Australia	44	3.36	4.55	1.43
Hong Kong	44	8.32	-1.60	0.28
Japan	44	-4.44	10.96	**2.12**
New Zealand	44	2.02	5.21	1.45
Singapore	44	1.25	7.29	1.31

This table shows the μ, α and t-stat for the regressions of developed markets.α refers to the Sell in May Effect, μ refers to the summer returns.

Table 13: Regression results for emerging markets

Country	Number of observations	μ	α	t-stat
Panel A: Americas				
Brazil	44	5.70	13.60	1.51
Chile	44	5.71	4.36	0.72
Colombia	40	4.87	15.67	**1.73**
Mexico	44	4.20	8.60	1.41
Peru	40	10.27	3.83	0.47
Panel B: Euro, Middle East & Africa				
Czech	38	-1.06	7.98	1.36
Egypt	36	6.51	13.34	1.30
Hungary	44	4.51	9.84	1.26
Morocco	36	-0.33	12.46	**2.21**
Poland	40	15.51	-3.90	0.21
Russia	36	5.22	23.85	**1.80**
South Africa	40	3.75	9.00	**1.94**
Turkey	44	15.65	24.98	**1.66**
Panel C: Asia				
China	24	-2.80	19.52	1.25
India	40	8.40	1.17	0.16
Indonesia	44	3.17	14.31	**1.64**
Korea	44	-0.63	15.46	**2.06**
Malaysia	44	1.21	9.40	1.49
Philippines	44	3.14	7.10	1.14
Taiwan	44	-4.57	16.38	**2.79**
Thailand	44	1.07	9.18	1.26

This table shows the μ, α and t-stat for the regressions of emerging markets.α refers to the Sell in May Effect, μ refers to the summer returns.

Table 14: Regression results for frontier markets

Country	Number of observations	μ	α	t-stat
Panel A: Americas				
Argentina	44	7.36	3.56	0.30
Panel B: Europe & CIS				
Bulgaria	14	-9.54	7.07	0.45
Croatia	20	4.77	2.81	0.28
Estonia	30	-3.62	24.23	**2.50**
Kazakhstan	24	5.25	36.29	1.11
Lithuania	8	16.03	-4.61	0.26
Romania	30	10.11	4.10	0.37
Serbia	8	11.04	2.86	0.12
Slovenia	20	8.49	-6.80	0.70
Ukraine	12	-22.03	29.79	1.28
Panel C: Africa				
Kenya	20	24.31	13.61	0.59
Mauritius	20	13.73	-2.56	0.27
Nigeria	20	9.09	3.33	0.28
Tunisia	8	6.27	-6.87	0.84
Panel D: Middle East				
Bahrain	14	-7.96	3.92	0.33
Jordan	44	-0.27	7.11	1.31
Kuwait	14	1.36	-0.86	0.10
Lebanon	16	7.33	-1.75	0.12
Oman	14	-0.29	8.55	0.69
Qatar	14	2.90	4.08	0.32
United Arab Emirates	14	1.84	-3.57	0.22
Panel D: Asia				
Bangladesh	6	0.18	-13.33	0.99
Pakistan	40	4.34	12.32	1.57
Sri Lanka	40	16.74	-12.73	1.33
Vietnam	12	3.36	-6.32	0.38

This table shows the μ, α and t-stat for the regressions of frontier markets.α refers to the Sell in May Effect, μ refers to the summer returns.

Table 15: Regression results for pooled data

Country	Number of observations	μ	α	t-stat
Panel A: Pooled data				
All countries	2316	2.96	8.89	**8.25**
Developed Markets	956	0.46	8.76	**8.20**
Emerging Markets	856	4.38	11.07	**5.53**
Frontier Markets	504	5.30	5.45	**1.85**
Panel B: MSCI World Index				
MSCI World Index	44	1.05	6.13	**1.86**
MSCI ACWI Index	44	1.07	6.25	**1.84**

This table shows the μ, α and t-stat for the regressions of pooled data.α refers to the Sell in May Effect, μ refers to the summer returns.

CHAPTER V: CONCLUSION

In my thesis, I examine the Sell in May Effect in developed, emerging and frontier markets. The Sell in May Effect is one of the most puzzling seasonal anomalies. It suggests that the investors should leave the market in May and come back to the market after November.

Previous studies, especially the studies of Bouman and Jacobsen (2002) and Andrade *et al.* (2013) found empirical support for the Sell in May Effect in two different time periods. They used a sample of 37 countries, mainly developed and emerging markets. My thesis represents a very comprehensive study of the Sell in May Effect. This study includes 24 developed markets, 21 emerging markets and 25 frontier markets. Using the pooled data on these three types of markets, I find strong evidence for the Sell in May effect in developed, emerging as well as in frontier markets. The Sell in May Effect is the strongest for emerging markets. For emerging markets the investors earn on average 11.07% higher returns during the winter semesters (November to April) compared to summer semesters (May to October). For developed markets the Sell in May Effect represents higher returns in the amount of 8.76% and 5.45% for frontier markets. The Sell in May Effect is significant for all of the markets at the 10 % level.

For country-by-country data, the strongest evidence for the Sell in May Effect is in developed countries where 16 out of 24 countries show significant Sell in May Effect. Although on average, the Sell in May Effect is stronger for emerging markets, only 8 out of 21 emerging markets have a significant Sell in May Effect on country-by-country level. Lower significance on a country-by-country basis for emerging markets is caused by generally higher volatility.

The question that remains to be answered is whether the Sell in May Effect remains an anomaly or if there exists a rational explanation for this effect. The most obvious explanation is

the possibility of different market risks during the winter and summer semesters. If the risk of the market is higher during the winter, then higher returns during the winter periods could be seen as a compensation of the investors for higher risk. To screen out this explanation, I use standard deviations as a proxy for risk and examine standard deviations for winter and summer semesters. Standard deviations are usually higher for summer than winter semesters. This suggests actually slightly higher risk during the summer months not the winter months. Therefore, seasonal differences in the risk of the markets do not represent a feasible explanation for Sell in May Effect.

Another possible explanation is that the Sell In May Effect may exist in theory but it does not persist once transaction costs are included. The Sell in May Effect, however, does not require frequent trading. The portfolio is sold only once and bought once during the year. The average Sell in May Effect of 8.89% therefore cannot be explained by transaction costs.

The main concern surrounding all seasonal anomalies is the argument of data mining. A comprehensive study of Sullivan *et al.* (2001) raised large concerns about many seasonal anomalies. Apparent statistical significances of many seasonal effects are not robust to data-mining considerations. So, could it be that the Sell in May Effect is also just a result of data mining? To cast out this possibility, a theoretical explanation of this effect should exist and the effect should be confirmed by out-of-sample test. As pointed by Bouman and Jacobsen (2002), a formal theory of the Sell in May Effect does not exist. However, the old saying "Sell in May and go away" is well known among investors. The out-of-sample tests of Sell in May Effect performed in the study of Andrade *et al*. (2013) and in this thesis offer strong support for the Sell in May Effect. These studies include both different time periods as well as a different sample of countries.

The significant results of the Sell in May Effect on MSCI indices also suggest that the Effect is not driven just by several countries and holds when the overall market capitalization is taken into consideration. It also suggests that the effect is not present only in local currency returns but holds also if the exchange rate between the local currency and the U.S. dollar is taken into account. Therefore it is possible for U.S. investors who invest in the U.S. dollar and diversifies across the markets to take advantage of this effect.

It seems that the Sell in May Effect is robust to rational explanations as well as data mining considerations. Investors may still benefit from timing their investments and increasing their market exposure during the winter semesters. In the end, I have to agree with Andrade, Chhaochharia and Fuerst that the "Sell in May and Go Away" just won't go away.

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