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The War in Ukraine and its implications: an equity analysis

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Index

Abstract

The aim of this work is trying to understand what is the relationship occurring between geopolitical events and swings in markets as well as changes in economic conditions worldwide. The study is structured into three sections: the first one goes through a literature review of how war in Ukraine has changed markets, considering both equity and commodities. In addition to this, a deeper study on three indexes has been conducted, using the Geopolitical Risk Index and trying to create specific trading signals based on the value of the aforementioned index. The second part focuses on the impact that conflict in Ukraine had on Foreign Direct Investments worldwide, which will then introduce the third part, where we will go deeper into the matter considering the risk of a future conflict between Taiwan and China and what could be the consequences. Thus, this work relies both on literature review, looking for potential insights into the matter, and on a sort of "field experiment", as it tries to find a hedge in markets with the set of information available each time. Findings of this work will confirm that there is indeed a strong relationship between geopolitical events and returns in the market that can be used to get higher returns, though causing a greater increase in terms of risk compared to the benchmarks used.

Introduction

These recent times have been determined by great geopolitical turmoil. War in Ukraine, war between Israel and Palestine, and going back, Covid -19 Pandemic, these are just a few examples of what the world has gone through. Such extraordinary events have had strong impacts on markets, with sudden swings and great uncertainty, causing even institutional investors, such as Warren Buffet, to divest from specific companies and accumulate liquidity, in hopes for more stable times. Thus, it is imperative for active markets players to be aware of the current geopolitical context, as fresher news allows for a crucial advantage. At the same time, a threshold will be met, where it is not possible to know in advance what will happen in the future, leaving a certain degree of risk to the everyday market operator. Looking at past events seems like a reasonable solution, though from time to time some conditions could change. For example, we could try to analyze the reaction of markets to one of the most important events of this century, the attack on Twin Towers, but the degree at which information travels nowadays cannot be compared to 20 years ago, as technology has done gigantic steps.

Hence, the objective of this study is to look for a meaningful way to understand what the relationship is connecting geopolitics and markets and how it could be possible to hedge financial positions in times of uncertainty as the ones we are experiencing. This task has been fulfilled through the usage of the Geopolitical Risk Index, which measures the relevance of events worldwide and gives us the possibility to hedge future market swing corresponding to relevant events.

The analysis is focused on two geographical areas. The first one is the United States Market, as it is one of the most relevant in the world and, given the strong ties it has globally, it is the one that can better represent how tensions worldwide can cause sudden losses of value even in local stocks. Specifically, the benchmark used to compare the investment strategy developed in the thesis is the well-renowed Standard's and Poor 500. As the objective of the pages ahead is to give institutional operators investing in developed countries a hedge to protect against market geopolitical risks overall, the second area in which we focused is Europe. Given this market has been less connected worldwide, it still has experienced great

uncertainty, offering unique opportunities to investors trying to catch the dip for good investment opportunities. To better understand whether the trading strategy developed is effective, we compared the returns to the Eurostoxx 50, which is the referring benchmark in Europe. Of course, this study would be incomplete if effects on markets worldwide were not considered. As a result of this consideration, the last benchmark analyzed is the MSCI All Country World Index (ACWI), which captures the performance of stocks without considering the area in which they are traded. This was done to prove that the extra returns found on the European and North American markets can be replicated even for more diversified indexes and to better capture what is the effect of certain events at a global level.

The analysis has been conducted using the aforementioned Geopolitical Risk Index, which arises around conflicts and tensions. Indeed, by studying the time series of data, it is possible, under certain circumstances, to understand if an event is about to occur and, consequently, hedge against the risk of such incidents, by taking positive exposure on the market or resorting to risk free instruments, such as the U.S. one month T-bill. Particular attention has been devoted to the matching of data release dates, to avoid any mismatch and ensure a working trading strategy. In addition to timing, we have selected different riskless instruments depending on timeframe and market. Finally, we compared the result obtained with long only positions on the three indexes, to better capture how this hedging strategy allows for higher returns and lower risks during times of uncertainty.

Chapter 1: Equities, Commodities and Geopolitical Events

1.1 Equity analysis of war in Ukraine

In the early morning of 24 February 2022, Russian troops enter Ukraine, starting what is currently known as the Russo-Ukrainian War. Europe has not experienced a conflict of such scale in 80 years, since the invasion of Poland in 1939. We can consider this moment as a turning point in recent times, as the risk of a global war has become a concrete possibility, shadowing uncertainty and fear both at a political and economic level. Even though local clashes had happened already in eastern Europe or in neighboring areas, for example war in Nagorno Karabakh in September 2020, the occupation of Crimea in February 2014 and so on, none of them had the same intensity and impact as the one we are experiencing at the moment.

Specifically, this conflict is characterized by one of the parties being involved not only at a regional level but at a global level, as Russia represents one the most important economies. Indeed, it used to be a partner of the G8 countries, from which it was cut off following Crimea annexation. In addition, it has one of the biggest armies in the world, with a strong defense industry supporting it. On the other hand, Ukraine's war effort has been sustained by NATO countries, with United States providing the biggest expenditure with approximately $ 300 billions in armaments, including artillery, military vehicles and even fighter jets. This context has set off two effects on suppliers: first, such a large battlefield is the perfect opportunity for mass experimenting. In fact, a wide range of new equipment has been tested directly on the battle ground, allowing for a better understanding of criticalities in products. Secondly, the effort to keep Russian forces out of Ukraine has allowed for a modernization of arsenals, as older equipment was exploited in the initial phases of the conflict.

Given the above considerations, it would come natural for an investor to look at this industry, as soon as the news of such a large conflict spreads out. Although this might seem a good idea, a few clarifications must be implemented to correctly allocate the investment and avoid negative market effects. Indeed, it is possible to

see that the return of stocks in defense industries varies strongly depending on a set of variable factors, such as R&D, size, leverage and so on as in Martins, Correia and Gouveia (2024 p.303). They examined the effect that war in Ukraine has on defense stocks. The methodology used to conduct this analysis has been that of identifying a sample of firms focused on military equipment production and filtering them depending on specific characteristics. They also identify two main effects happening when a conflict erupts: the first one is the so called "hoarding effect", representing the increase in demand of weaponry by the countries directly involved and the neighboring ones. This for example, has been the case for European countries, increasing import for defense products by approximately 65% (SIPRI report, 2023). The second one is the "control effect", representing the reduction in arms exports due to restrictions in trade dictated by the ongoing conflict. These two dynamics contribute in the same way to production in this field. Hence, it has been necessary to define new characteristics to effectively understand what the direction of this sector could be.

Another important aspect to take into account is the capability that certain firms have to influence policies, the so called "lobbying". Indeed, the higher the capacity of getting contracts, the higher is the expected cash flow for firms. Of course, state owned firms were cut out of the sample, as they would corrupt the study by showing higher values compared to other competitors.

Even firms' operational aspects have relevance, as found in Zhong and Gribbin (2009). In fact, capital expenditure and investments in Research and Development tend to be correlated to the profitability of the firm and, in turn, to the aggregate return that investors can get from them in times of conflict. For what concerns capital expenditure, the higher is the investments in plants and facilities, the higher is the probability that in times of low demand the firm will suffer losses, as it will face higher fixed costs. For what concerns R&D instead, as presented in Rogerson (1989), higher investments in this field should be positively correlated too profits, as innovation guarantees an advantage over potential enemies. This has been the case for example for Lockheed Martin, producing the highly advanced F-35 fighter jet, as it has allowed western countries to earn still unmatched superiority in combat.

To further filter out the sample of defense firms taken into account in the study, the authors differentiated between three clusters: “Very HEAVY” companies, having more than 66% of their revenues from sales of defense supplies, from “HEAVY” industries, with this percentage comprised between 33% and 66% and finally “LIGHT” firms, where revenues amount to a percentage between 10% and 33%. This last category has been used as a control variable in the models used to understand aggregate returns from investments in this sector.

Other variables used to better capture market returns and understand the determinants and drivers are:

1) SIZE, defined as the market capitalization in US dollars.
2) INST, which describes the percentage of stock held by institutional investors.
3) LIQ, which is the ratio of current assets to total assets.
4) TLEV, defined as the ratio between total debts and total assets.
5) ROA, the ratio of operating income to total assets.

Dwelling into these variables furthermore, SIZE represents the capability of the firm to ascertain its market power on competitors, as it was able to attract a higher number of investors. At the same time, Return On Assets and the amount of shares held by Institutional Investors represents the capability of the firm to be managed in a proper and profitable way. As shown in Boehemer and Kelley (2009) and La Porta et al (2002), institutional investors tend to look for profit maximation, hence, the higher the shares owned, the higher the chances that a company will be more profitable and guarantee higher aggregate returns. Finally, liquidity represents the ability of a firm to respond to market shocks in an efficient way, being able to meet cash obligations, according to Almeida et al. (2005) and Bates et al. (2009).

Given this premise, Martin et al. (2024) tried to capture what was the Cumulative Abnormal Returns (CAR) of an investment in defense firms at the beginning of the conflict and how each of the variable indicated above contributed to the overall result. In addition to this, the objective of the study was to prove 5 different hypothesis:

1) The conflict in Ukraine allowed for higher short term returns on defense stocks.
2) Firms heavily relying on defense contracts for revenues experienced higher returns with respect to firms with lower dependence on armament sales.

3) The conflict was beneficial in terms of returns especially for European and American companies.
4) Firms having higher capital and Research and Development investments experienced higher returns.
5) The effect of the conflict on Abnormal Returns relies strongly on firm specific characteristics.

The model used for this by Martins et al. (2024) was the famous Four Factor by Fama French (1996) and Carhart (1997) model (FF4), together with the Market Model. Abnormal Returns (AR) were defined as the difference between the actual returns experienced at the beginning of the conflict and the expectation of return as produced by the FF4 model. The study focused on finding AR between T=-1 and T=+5 and T=+10 with respect to the day the conflict started. Additionally, to better understand the influence of the variables listed above, a cross-sectional analysis was conducted through the use of an Ordinary Least Square (OLS) regression, as shown in the equation below:

$$CAR = \beta_0 + \beta_1 \ln(SIZE_i) + \beta_2 INST_i + \beta_3 LIQ_i + \beta_4 TLEV_i + \beta_5 ROA_i + \beta_6 R\&D_i + \beta_7 CAPEX_i + \beta_8 VERY\ HEAVY_i + \beta_9 HEAVY_I + \epsilon_i$$

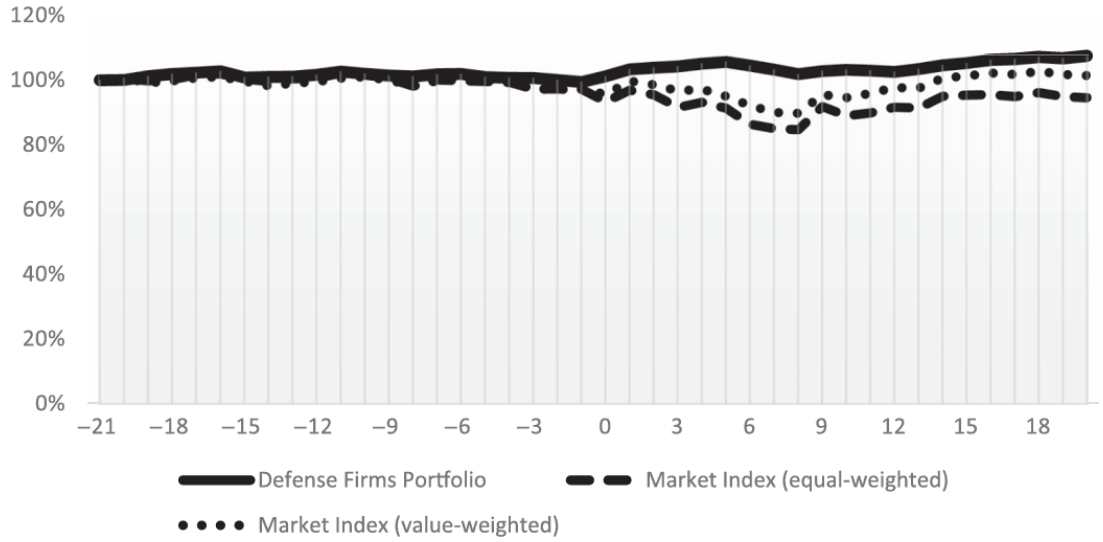
Results of the analysis on CAR, divided by geographical area, are shown in the next page. As we can notice, they seem to validate hypothesis 1, as AR for defense firms are positive across the three periods analyzed. In addition to this. Hypothesis 2 and 3 are confirmed as well, with higher AR for firms relying heavily on defense contracts and for European and American companies. This is likely due to the fact that the conflict is focused in Europe and part of the armament constituting the arsenal of European countries is imported from American firms, such as Boeing, Lockheed Martin and so on.

For what concerns the cross-sectional analysis on CAR, almost all of the variables used in the OLS regression appear to be significant and having an impact on market returns, with just liquidity (LIQ) and leverage (TLEV) being statistically insignificant, probably due to the fact that defense firms have not experienced drop in cash flows and a consequently financial distress. Thus, overall results seem to confirm hypothesis 4 and 5, given that R&D expenditure explains part of the AR

experienced and that the characteristics of each firm will allow for better performance on the market.

Variable	Model	Mean (%)	SD (%)	25th perc (%)	Median (%)	75th perc (%)
Panel 1: All Sample (100 defense firms)						
CAR	MM	3.24	5.37	0.19	2.90	5.70
[−1,1]	FFC4	3.88	5.55	0.30	3.10	5.92
CAR	MM	5.54	12.38	−0.28	4.13	9.77
[−1,5]	FFC4	5.65	12.55	−0.34	4.35	10.05
CAR	MM	3.02	16.30	−6.81	1.52	9.97
[−1,10]	FFC4	3.39	16.98	−7.04	1.98	10.33
Panel 2: Portfolio of Defense Firms in the Revenue Class VERY HEAVY (25 defense firms)						
CAR	MM	8.73	5.28	4.82	7.94	11.53
[−1,1]	FFC4	9.08	5.60	5.10	8.54	11.98
CAR	MM	19.18	13.85	11.36	14.70	21.60
[−1,5]	FFC4	20.12	14.20	11.55	15.02	22.01
CAR	MM	21.23	16.89	12.19	16.51	23.54
[−1,10]	FFC4	21.93	16.99	12.55	16.88	23.87
Panel 3: Portfolio of Defense Firms in the Revenue Class HEAVY (29 defense firms)						
CAR	MM	4.08	3.24	2.35	3.78	5.78
[−1,1]	FFC4	4.34	3.45	2.50	4.02	5.96
CAR	MM	6.71	4.01	4.30	6.09	8.08
[−1,5]	FFC4	6.96	4.22	4.55	6.33	8.20
CAR	MM	3.84	7.50	−0.58	4.26	8.36
[−1,10]	FFC4	4.09	7.89	−0.69	4.40	8.49
Panel 4: Portfolio of Defense Firms in the Revenue Class LIGHT (46 defense firms)						
CAR	MM	−0.27	3.50	−1.40	0.22	1.78
[−1,1]	FFC4	−0.33	4.00	−1.65	0.40	1.98
CAR	MM	−2.61	7.28	−4.01	−1.10	1.26
[−1,5]	FFC4	−2.89	7.50	−4.15	−1.30	1.40
CAR	MM	−7.40	10.10	−12.65	−6.89	−0.26
[−1,10]	FFC4	−7.53	10.32	−12.86	−7.03	−0.32
Panel 5: Portfolio of European Defense Firms (20 defense firms)						
CAR	MM	2.38	7.78	−0.57	0.86	7.20
[−1,1]	FFC4	2.49	7.99	−0.65	1.04	7.82
CAR	MM	10.22	12.94	−4.92	10.35	20.65
[−1,5]	FFC4	10.43	13.23	−5.33	10.66	21.12
CAR	MM	10.11	18.69	−8.85	9.44	23.35
[−1,10]	FFC4	10.54	18.93	−9.05	9.65	23.98
Panel 6: Portfolio of North and South American Defense Firms (35 defense firms)						
CAR	MM	3.96	5.29	0.57	3.58	6.33
[−1,1]	FFC4	4.11	5.43	0.66	3.70	6.50
CAR	MM	5.22	10.02	−1.10	5.10	11.58
[−1,5]	FFC4	5.38	10.54	−1.23	5.34	11.87
CAR	MM	5.73	12.10	0.01	4.78	13.11
[−1,10]	FFC4	5.96	12.43	0.13	4.98	13.32
Panel 7: Portfolio of Asian Defense Firms (45 defense firms)						
CAR	MM	0.76	4.04	−1.46	0.60	1.95
[−1,1]	FFC4	0.84	4.32	−1.55	0.69	2.09
CAR	MM	1.71	5.19	−1.21	1.17	3.42
[−1,5]	FFC4	1.89	5.25	−1.33	1.35	3.59
CAR	MM	0.24	5.52	−3.84	−0.02	1.36
[−1,10]	FFC4	0.38	5.65	−4.02	−0.05	1.45

Source: Martins et al. (2024). Data provided by the authors.



Note(s): The Figure shows the event-time equal-weighted cumulative abnormal returns for the portfolio of the world's 100 largest listed defense firms (solid line), equal-weighted market index returns (dashed line) and value-weighted (dotted line). Event-time 0 (event day) indicates the day of the beginning of the military conflict between Russia and Ukraine. The *X*-axis refers to the relative number of days before and after the event day

Source: Martins et al. (2024). Data provided by the authors.

Given that we were expecting AR to be high for the military equipment companies overall, and after having proved that firm specific factors can amount for a certain advantage compared to the rest of the industry, it would be naturally interesting to extend the analysis to equity stocks overall and not just the defense sector, to try and capture what was the general effect on markets and thus prepare a strategy for the future in case an event of such type could occur. In doing so, we focused the literature review both on stock indexes and equity funds in Europe. This was done to better understand equities performance and what was the strategy adopted by funds managers when war abruptly entered the scene.

Focusing on the first part, we will base our study on the work conducted by Boubaker et al. (May 2022) and Ferràndez – Serrano and Angosto – Fernàndez (November 2022). The former study analysed the behaviour of all the countries included in the Morgan Stanley Capital Investment market classification, comprise of 23 developed countries and 24 developing ones. Methodology is quite analogous to the work done by Martins et al. (2024), using the CAR with the formula provided by Brown and Warner (1985) and as reported below:

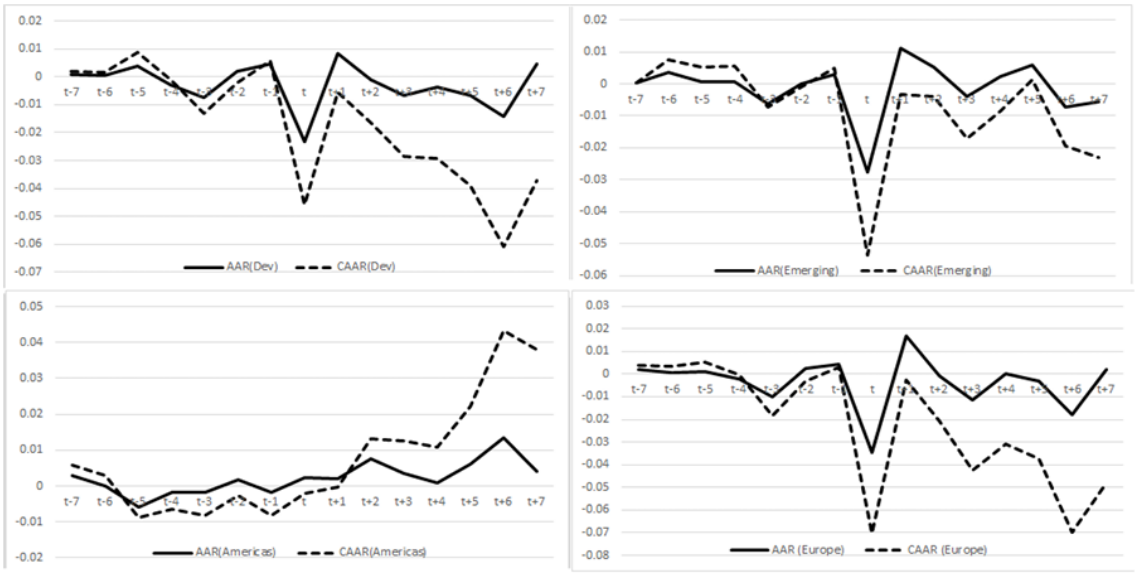
$$AR_{it} = R_{it} - \left(\hat{\alpha} + \hat{\beta}\, R_{mt}\right)$$

where R_{it} is the actual log return on day t and $\hat{\alpha}$; $\hat{\beta}$ represent intercept and coefficient of an OLS regression.

An additional cross-sectional analysis was performed to better understand if CAR could be explained by the following variables:

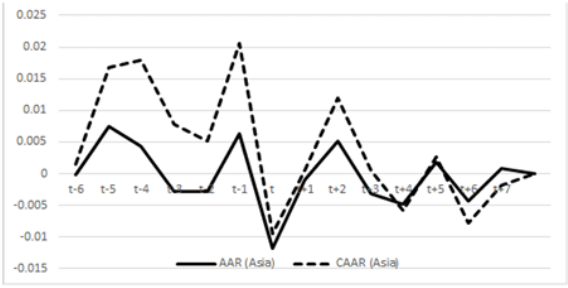
1) Trade to GDP (Sikarwar (2021).
2) Past returns (Chaturvedula et al., 2015).
3) US dollar exchange rate (EXRATE).
4) NATO, a dummy variable assessing wheter the country belongs to the treaty
5) DEV, another dummy variable for developing countries.

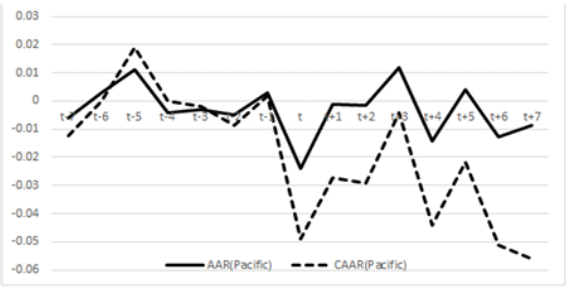
Results, shown in the table below, demonstrate that overall countries showed negative AR on the event day, apart from pan American and Asian markets, likely due to the actual distance from the conflict and the low fear that it would turn into a bigger confrontation. For what concerns the regression, researchers noticed in 44 countries stronger currencies were associated with lower AR, likely due to the uncertainty o international trade characterizing such events. This result is in line with the work done by Mishra and Mishra (2020). Trade to GDP shows significance as well, being related to negative AR both at time T, T=+3 and T=+5.

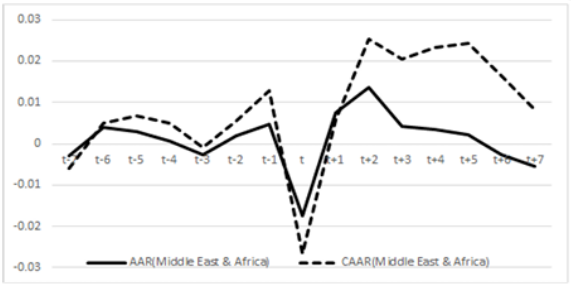


AAR and CAAR graphs during the event window around the beginning of war.

Source: Boubaker et al. (2022). Data provided by the authors.







Cumulative abnormal returns for the event day and post-event windows.

Country	Developed markets Event [0,0]	Post-event [+1,+3]	[+1,+5]	Country	Emerging markets Event [0,0]	Post-event [+1,+3]	[+1,+5]
United States	0.85**	–0.71*	0.47	China	–1.47*	1.44*	1.15
	(2.02)	(–1.69)	(1.12)		(–1.79)	(1.75)	(1.40)
Spain	–2.48***	–0.75	–3.13***	Turkey	–8.57***	5.12***	7.18***
	(–2.62)	(–0.79)	(–3.30)		(–4.54)	(2.71)	(3.81)
Italy	–3.47***	0.96	–0.66	Brazil	0.02	2.54**	2.00
	(–5.28)	(1.47)	(–1.00)		(0.02)	(2.03)	(1.59)
Germany	–3.52***	–1.81**	–3.54***	South Korea	–2.06**	1.01	3.28***
	(–4.32)	(–2.22)	(–4.34)		(–2.41)	(1.19)	(3.84)
France	–3.38***	–2.86***	–3.47***	India	–4.48***	0.24	–0.41
	(–4.08)	(–3.46)	(–4.20)		(–5.71)	(0.31)	(–0.53)
UK	–3.70***	1.05	–0.47	Chile	0.69	0.24	3.36**
	(–5.40)	(1.53)	(–0.68)		(0.45)	(0.15)	(2.19)
Belgium	–1.49**	0.57	–1.15	Poland	–11.00***	6.30***	7.77***
	(–2.13)	(0.81)	(–1.64)		(–11.36)	(6.51)	(8.02)
Switzerland	–2.22***	1.33**	–0.45	Czech Republic	–4.80***	0.14	0.82
	(–3.30)	(1.98)	(–0.67)		(–7.52)	(0.22)	(1.28)
Netherlands	–2.12***	–0.19	–1.61**	Peru	–0.97	2.93**	3.46***
	(–2.88)	(–0.26)	(–2.19)		(–0.78)	(2.35)	(2.77)
Canada	0.52	0.23	1.04***	Malaysia	–0.73	1.19*	2.45***
	(1.43)	(0.64)	(2.84)		(–1.08)	(1.76)	(3.63)
Portugal	–1.24	2.03***	1.18	Philippines	–2.02*	0.47	1.39
	(–1.58)	(2.58)	(1.50)		(–1.75)	(0.41)	(1.21)
Austria	–7.07***	–7.84***	–8.07***	Mexico	0.49	2.69***	3.14***
	(–7.17)	(–7.95)	(–8.18)		(0.68)	(3.71)	(4.35)
Israel	–2.62***	–0.09	0.15	Indonesia	–1.40*	0.00	0.46
	(–3.18)	(–0.11)	(0.19)		(–1.94)	(0.00)	(0.63)
Sweden	–2.42***	–0.49	–2.49***	Saudi Arabia	–1.74**	2.01**	3.73***
	(–2.97)	(–0.60)	(–3.05)		(–2.08)	(2.40)	(4.46)
Ireland	–4.14***	–2.15**	–5.54***	UAE	–0.44	3.96***	5.76***
	(–4.49)	(–2.33)	(–6.00)		(–0.52)	(4.70)	(6.84)
Norway	–0.08	3.24***	2.35***	Thailand	–1.84***	1.30**	1.14**
	(–0.09)	(3.71)	(2.69)		(–3.26)	(2.30)	(2.02)
Australia	–2.71***	1.06	1.70**	Qatar	–0.97*	5.59***	6.63***
	(–3.72)	(1.45)	(2.33)		(–1.79)	(10.32)	(12.24)
Denmark	0.81	5.74***	4.28***	Colombia	–0.05	1.32	0.72
	(0.67)	(4.74)	(3.53)		(–0.04)	(1.10)	(0.60)
Japan	–0.45	2.60***	1.37	Greece	–6.28***	–3.31***	–5.01***
	(–0.43)	(2.46)	(1.30)		(–7.58)	(–3.99)	(–6.05)
Finland	–3.24***	–2.85***	–4.57***	South Africa	–1.31	3.91***	3.93***
	(–3.90)	(–3.43)	(–5.49)		(–1.41)	(4.21)	(4.24)
Singapore	–3.41***	–0.37	–1.35**	Kuwait	–1.50**	0.60	0.04
	(–5.09)	(–0.56)	(–2.02)		(–2.53)	(1.01)	(0.07)
Hong Kong	–2.81**	–1.23	–2.72**	Egypt	–3.57***	1.74**	1.52*
	(–2.48)	(–1.09)	(–2.40)		(–4.03)	(1.97)	(1.71)
New Zealand	–3.21***	3.80***	3.92***	Hungary	–10.04***	–10.75***	–4.16***
	(–4.58)	(5.43)	(5.60)		(–9.72)	(–10.40)	(–4.02)
				Taiwan	–2.48***	–0.25	0.05
					(–2.96)	(–0.30)	(0.06)

Note – Returns are in percentage. ***, ** and * denote significance at the 1%, 5% and 10% statistical levels, respectively.

Source: Boubaker et al. (2022). Data provided by the authors.

Ferràndez – Serrano and Angosto – Fernàndez (2022), showed a similar approach, analyzing indexes from 77 countries worldwide. This time, the method used was the SUR model (Zellner, 1962; Binder, 1985). The additional insight provided in this work is that it allows for a deeper understanding on what is the effect of being a country belonging to NATO, to former Soviet Union, or to both. In addition to this, dependences on natural gas, Russian imports and the amount of gas imported were taken into account, to give a bigger picture of political and economic effects on markets. Results show similar outcomes to Boubaker et al. (2022), with the European and North American market showing the highest R square and resulting the one of the worst and best results of the da respectively. What is added to this, is that part of the loss was due to dependence on Russian gas in a significant way, highlighting the political aspect related to markets. Belonging to former Soviet Union and then joining NATO was a factor proved to put pressure on markets, given that "Russia might perceive as a betrayal" such behavior, leading to possible retaliations.

To conclude this in-depth analysis of equities markets, we report the results obtained by Yarovaya and Mirza (2022). In this paper, researchers tried to understand what the effect of war in Ukraine on equity mutual funds was and the relative strategies adopted to hedge against such geopolitical event. They also follow an interesting geographical area clusterization, considering funds in Russia, Ukraine, NATO states and those abstained during the voting on UN resolution of March 2nd, 2022. Funds selected for the analysis are characterized by exposure in the belligerent countries and NATO ones. In addition to this, such positions must be held for at least two years, to rule out potentially non-influential observations. The method adopted to compute CAR is GARCH, as suggested by Mirza et al. (2020). As a benchmark for market, MSCI Europe Index was used, whilst the risk free rate was represented by the five-year Euro Government yield. Country risk premium was considered as well for states belonging to different geographical areas from Europe.

The results show that even though exposure was common on all funds, reactions depending on the market were very different. At T=-5 and T=-3 NATO countries, Europe, Ukraine and Abstained countries present no significant negative

AR. Instead, Russia suffered the beginning of sanctions, immediately put into action to avoid any escalating of conflict by western countries, already from 21st February 2022. This cause negative AR for funds with exposure in Russia. On the event day, NATO and belligerent countries suffered negative AR, with U.S. experiencing less negative returns, likely due to the geographical effect of less perceived risk of conflict in America. Abstained countries did not experience negative returns. Instead, they present positive AR at T, T=+3 and T=+5. This is probably explained by a divestment from countries involved in the conflict and channeled toward these states and a general neutral position on this geopolitical matter. Finally, even if NATO and Europe regained AR on T=+3 and T=+5, whilst Ukraine and Russia continued to experience lower AR, though the latter was quicker to recover compared to the former.

1.2 Commodities analysis of war in Ukraine

Another important aspect to be analyzed is the impact that war in Ukraine had on commodities market. Most markets have experienced shocks following this geopolitical event, especially in energy sectors. For example, the huge rise in the price of gas futures at the Amsterdam Exchange is one of the visible effects that has affected everybody's life at one point in the last three years. Thus, among the other aspects, we will look for the cause of such increases in price and the potential strategies that could be implemented to hedge against such risk.

Before going further into the subject, it is important to define two main categories in which commodities can be clustered during crisis and shocks: the first one is the transmitter. Usually, transmitters are markets or commodities transmitting price changes to other markets or financial instruments. On the other hand, receivers are securities or markets experiencing the raise on prices without being able to influence other peers. Of course, in certain conditions, clusterization may vary, with a market passing from a transmitter to a receiver. Once these definitions have been set clear, we can move on with the literature review on this subject.

This analysis has focused on three main aspects: first, the impact on commodities production and the material reason behind such price swings; second,

how these shocks have changed global economy; third, what were the price movements of the main commodities and how to hedge in such geopolitical turmoil.

For the first point, we analyzed the study by He et al. (2023), which goes deeper into the mechanism of price changes of grain commodities and the consequent crop land reallocation at a global level. Indeed, researchers were able to capture price drivers thanks to a sensitivity analysis. The model used to get such results is the CARD – IACM, used in agricultural economics to understand and "*quantify the impact of market changes and policies on global land allocation, production, consumption and trade of a broad set of agricultural and biofuel commodities*" (He et al., 2023). This model was first developed by Durmotier, Carriquiry and Elobeid in 2021. Four different scenarios were included in the analysis, as summarized in the table below, and then compared to the estimation of market performance without the geopolitical event, i.e. war in Ukraine.

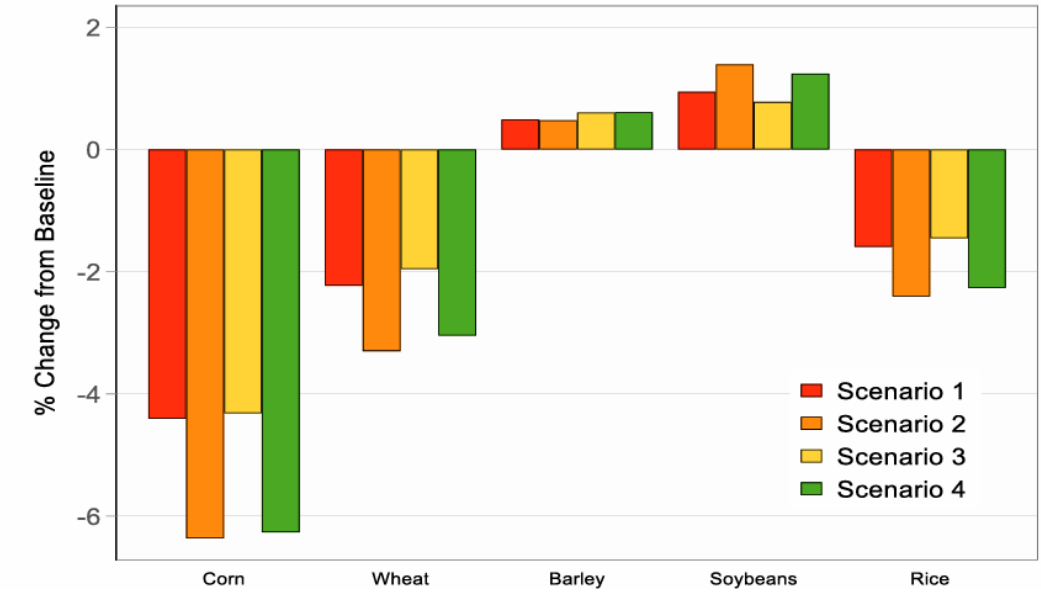
	Reductions in Ukraine's Exports of Barley, Wheat, Corn, and Sunflower Oil	Increase in Global Prices of Nitrogen, Phosphorus, and Potassium
Scenario 1	25%	100%
Scenario 2	25%	150%
Scenario 3	50%	100%
Scenario 4	50%	150%

Source: He et al. (2023). Data provided by the authors.

These scenarios suppose an increase in Nitrogen, Phosphorus and Potassium because these are the main fertilizers used for grain production. Interesting enough, one of the main exporters of these materials is Russia, which embargoed these commodities to countries such as Ukraine, leading to a reduce production and, in turn, an increase in price. Due to the economic sanctions and restrictions on trade, exports from Russia to European countries drastically reduce as well, inducing a compound effect on the price of grain futures.

Another relevant aspect causing grain price to increase is the impossibility for Ukrainians producers to export part of their production through harbors on the Black Sea, as the Russian navy blocked this seaway in the summer of 2022. These effects have caused not only the well-known market spikes, but have shifted world production, moving from crops requiring a high amount of fertilizers, toward low

usage of Nitrogen, Phosphorus and Potassium, such as barley. This result has been well represented in the table below.



Percentage Changes in the Harvested Area of Major Feed Grains in 2025/26 for Countries Other than Russia and Ukraine under Different Scenarios Relative to the Baseline

Source: He et al. (2023). Data provided by the authors.

Now, as we understood the driver of this shock, we move on to analyse the effect on global economies overall. The work done by Rose et Al. (2023) summarizes the effect of commodities shock and supply chain disruption cause by the conflict in Ukraine. The model used to ascertain such figures is the GTAP (2022) CGE Modelling System, currently one of the most used in this field. The data analysed comprise 17 countries and 44 natural commodities, divided into sub-categories for grain types. The results of the study show that this shock cost Ukrainian economy an estimated $ 859 million of GDP reduction, counting for 0,65% of national GDP. Other countries, such as Asian ones, di experience relatively significant losses, mainly cause but disruption in distribution chains. On the other hand, countries like India or NATO states have experienced gains, as they filled the gaps left by Ukrainian and Russian products. Russia itself did not experience such losses, with a mere 0,0002% od GDP reduction due to grain exports disruption. Finally, the analysis highlights the fact that the embargo posed by Russian Navy in the Black Sea has caused an estimated 30% increase in the loss of of Ukrainian GDP, as it represents the most efficient way to supply commodities worldwide.

In this last part of the chapter, we will dwell into dynamics of commodities and what securities and markets can be categorized as transmitters and which are receivers of price shocks. In doing so, we analysed the paper by Alam at al. (2022), studying the effects of war in Ukraine on 5 different commodities and understanding the connectedness each material has with the market in which it is traded. The model used in this work is the Time-Varying Parameter Vector Autoregressive also known as TVP-VAR, defined first by Antononakis et Al. (2020). This methodology allows for fluctuation over time and guarantees a more robust estimation. Five main commodities were considered for this study: gold, silver, platinum (of which Russia is one of the main producers and exporters in the world), WTI crude oil and natural gas.

The study finds that strong connectedness is present between all the materials and the markets analysed. In addition to this, countries closer to the conflict area appear to have higher volatility compared to countries far from Ukraine and Russia. For what concerns price dynamics, gold appears to be a receiver of shocks, whilst platinum, oil and natural gas are more transmitters. Silver behaves as both. In addition to this, connectedness increased after war erupted, showing the capability of transmitter markets to spill over shocks to recipient markets, such as US, Canada, China and Brazil. This is well represented in the graphs below.

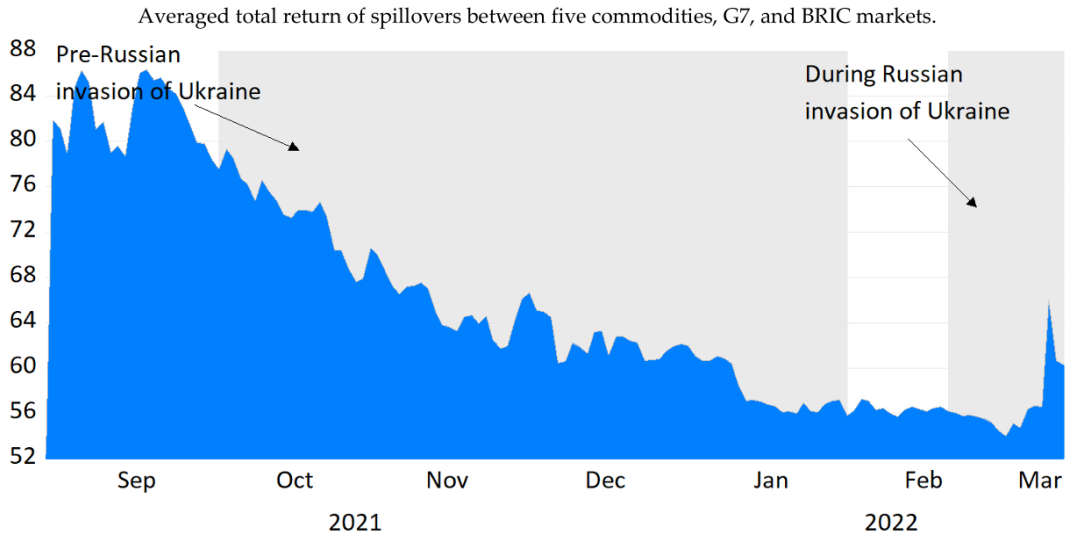


Figure 3. Total time-varying spillovers between five commodities, G7, and BRIC indices. Note: See Figure 2.

Source: Alam et al. (2022). Data provided by the authors.

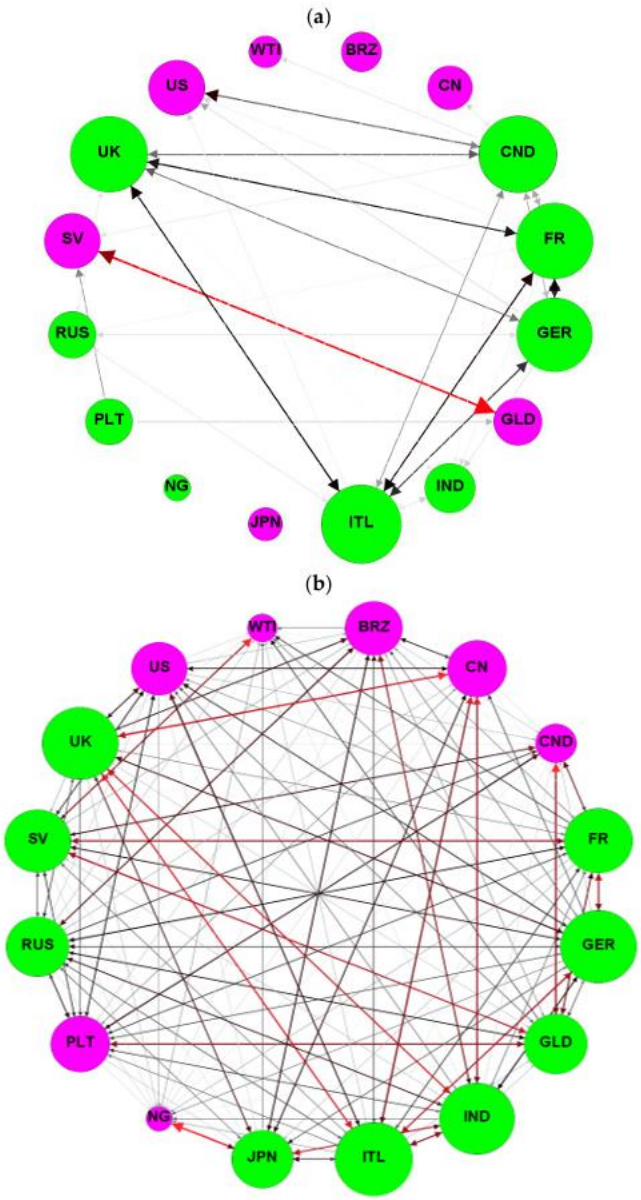


Figure 2. Network connectedness spillovers between the five commodities, G7, and BRIC markets. Additionally, within the network, the size of the node indicates the magnitude of the contribution of every index to the connectivity of the system, while the colour indicates the origin of the connectivity. The size of the node indicates the level of overflow, and the colour determines whether the market is a net sender (green) or a recipient (pink) of spillover. The finite directional layout algorithm determines the position of the vertices, with the number of vectors determining the route of the vertices. The width of the arrow indicates the strength of the multiple gradients, and the colour determines the direction of the gradient from the strongest (red) to the weakest (black). Note: The outcomes are constructed on a first-order TVP-VAR model with a first-order delay length and a 20-level generalized forecast error variance within the estimates. (**a**) Pre-Russian invasion of Ukraine. (**b**) During Russian invasion of Ukraine.

Source: Alam et al. (2022). Data provided by the authors.

Chapter 2: Geopolitical Risk and Trading Strategies

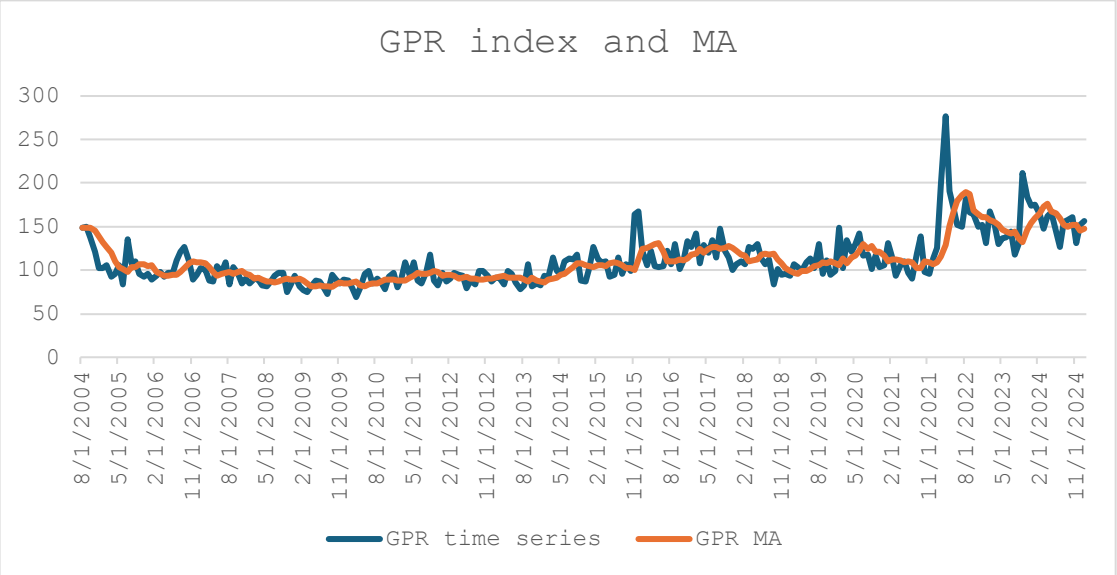
2.1 Geopolitical Risk Index and Relevant Events

As we have seen in chapter 1, war in Ukraine has proved to have a strong effect on equity and commodities markets. Thus, we could suppose that, in general, relevant geopolitical events might influence markets. This kind of causal relationship could be used in our advantage. Finding the connection between an observable variable, indicating this risk, and the market performance is key in exploiting such swings in prices. Indeed, by observing, or, in some cases, forecasting such variable, one could take positions on time and profit from these events. For this reason, we use the Geopolitical Risk Index (GPR), developed by Caldara and Iacovello (2022). This index, built thanks to a text mining algorithm developed by the same authors, checks the number of articles having as subject war or geopolitical tensions, such as the attack on Twin Towers, Cuban Missile Crisis, Korean war, war in Ukraine and so on. The study is based on the analysis of three historical American newspapers and index calculation starts in 1900, although it is important to notice that these papers, being American publications, may be skewed toward events involving U.S. as a major actor. Nevertheless, the strong correlation of the index with geopolitical events at a global level, guarantees the capability of the index to capture these happenings. In addition to the index itself, the authors provide a database, in which we the percentage of articles related to six categories is collected. The categories are:

1) War Threats
2) Peace Threats
3) Military Buildups Threats
4) Nuclear Threats
5) Terror Threats
6) Beginning of war acts
7) Escalation of war acts
8) Terror acts.

As one may notice, we have 5 categories dedicated to threats and 3 categories focused solely on acts. Finally, Caldara and Iacovello produced index values for 10 English written newspapers from 1985, as well as computation for several countries.

To understand when relevant events are happening using this index, we built an indicator based on the Moving Average (MA) method. We noticed that changes in value of GPR Index have a latency of about six months. Hence, we computed the MA for the time series, selecting an interval starting from august 2004 to January 2025, as the financial data on which the analysis that we will see on the next paragraph were available for this period only. The graph below shows how moments of tensions between countries result in observations higher than the MA of the series.



Source: graph provided by the author. Data provided by Caldara and Iacovello. MA is computed for past 6 months observations.

This criterion already shows some outliers but there is the risk that general tensions in a specific area may result in an increase of the index above its MA, especially after "peaceful" times, but these values do not always indicate a potentially relevant event. Thus, we need to further refine this instrument.

By looking at the graph, we could notice that geopolitical developments usually happen when the value deviates from the mean by 20. So, we build a dummy variable, called "Historical GPR" (HGPR), taking value as shown below. Indeed,

the intervals selected allow for a good observation of relevant events in the last 20+ years, avoiding false positives.

GPR value with respect to MA	HGPR Dummy Variable Value
GRP Index – MA > 20	1
-20 <GRP Index – MA > 20	0
GRP Index – MA < -20	-1

Source: table provided by the author.

The relevant events on which these values were observed are summarized below.

01/07/2005	London Bombings
01/08/2006	Avian Flu And Transatlantic Air Plot
01/09/2006	Avian Flu And Transatlantic Air Plot
01/03/2011	Beginning of Invasion of Lybia
01/09/2011	End of Invasion of Libya, Gheddafi's death and Sovereign Debt Crisis
01/03/2014	Crimea Invasion
01/01/2015	Charlie Hedbo Attacks
01/11/2015	Bataclan Attacks
01/12/2015	Battle for Ramadi and tensions between PKK and Turkey
01/12/2016	Battle for Aleppo, Palmyra, Mosul, Raqqa and Berlin Truck attack
01/02/2017	Battle of Al Bab, Istanbul attack, Battle of Mosul
01/08/2017	Barcelona Attack
01/08/2019	Geopolitical tensions in July and August between North Korea and USA
01/01/2020	Tensions between Iran and USA
01/03/2020	Covid-19 Pandemic
01/01/2021	Capitol Hill Attacks
01/09/2021	Withdrawal of USA troops from Afghanistan
01/02/2022	War in Ukraine
01/03/2022	War in Ukraine
01/04/2022	War in Ukraine
01/10/2023	Israel October Attacks
01/11/2023	Israel October Attacks
01/12/2023	Israel October Attacks

Source: table provided by the author

Now, given the amount of data provided by Caldara and Iacovello, a selection was needed, to avoid any redundant information and complex calculations while producing trading signals as we will later see. Thus, we computed correlation between price movements of three indexes and the time series for 22 different variables available for consultation. The indexes on which the analysis focused are S&P 500 (as GPR is computed studying American newspapers, it is likely that it

will show serial correlation with price movements), Eurostoxx 50 (as it belongs to Developed Economies) and MSCI All Country World Index (ACWI), the last one used to capture the effects of geopolitical shocks worldwide. Studies were conducted on lag returns as well, since they show no serial autocorrelation, as opposed to prices, but values were quite low, in the range between -0,1 and 0,1. Nevertheless, values showed by price time series indicated that strong correlation was present between Historical GPR Including Excluded Words (as Historical GPR is build using more stringent requisites for certain articles to be accounted for computation) and the percentage Share of Articles on War Threats, Military Buildups Threats and Beginning of War Acts. Results are shown in the table below.

Correlation coefficients	S&P 500	Eurostoxx 50	MSCI ACWI
Historical GPR Excluded Words	0,67	0,49	0,64
War Threats	0,63	0,45	0,61
Military Buildups	0,61	0,37	0,60
Beginning of War	0,63	0,53	0,59

Source: table provided by the author

The choice of these variables is strategic as well, as share of articles on War Threat and Military Buildups allow for a certain degree of forecast of potential geopolitical shocks. Interesting enough, the three indexes time series show positive correlation with geopolitical events, meaning that the indexes will benefit from such events rather than suffering from geopolitical tensions. Nevertheless, the strategy that we will use will divest toward safer investments when the GPR goes up and long the index the opposite way. To further integrate the analysis, three additional dummy variables have been created, respectively WT, MB and BW, assuming values -1, 0 and 1 depending on the difference of the observations with respect to the six months MA. The table below sums up the parameters.

	WT - MA < -0,15	-0,15 < WT - MA < 0,15	WT - MA > 0,15
War Threats	-1	0	1
	MB - MA < -0,4	-0,4 < MB - MA < 0,4	MB - MA > 0,4
Military Buildups	-1	0	1
	BW - MA < -0,2	-0,2 < BW - MA < 0,2	BW - MA > 0,2
Beginning of War	-1	0	1

Source: table provided by the author

Last but not least, it is important to remind that the frequency of update of GPR index is every first workday of the month. Consequently, data chosen for comparison are update at the beginning of the month as well. Indeed, data reported on prices of the three indexes refers to the open price of the first day of the month, to respect consistency. Same goes for the risk-free data used in the second paragraph of this chapter.

2.2 Construction of a Trading Strategy

Now that we have studied the relationship between GPR variables and the price movements of S&P 500, Eurostoxx 50 and MSCI ACWI, and having found that there is a positive correlation between them, we can build a trading strategy on the time series analysed and check for the actual profitability of the strategy built.

Before we start, a few remarks will allow for an easier understanding of the system built. It involves either buying the index at the beginning of the month for one month or take a riskless position by buying exposure in 1-month riskless bonds, such as T-bills. In addition to this, selected risk-free rates are the "Market Yield on U.S. Treasury Securities at 1-Month Constant Maturity, Quoted on an Investment Basis, Percent, Monthly, Not Seasonally Adjusted" for S&P 500 and MSCI ACWI and Euribor 1-Month rate. Monthly inflation rate, computed monthly, has been accounted as well, to provide for a complete and realistic view of the model. Data used for inflation are the "Consumer Price Index for All Urban Consumers: All Items in U.S. City Average, Percent Change, Monthly, Not Seasonally Adjusted" for S&P 500 and the "Harmonized Index of Consumer Prices: All Items for Euro area (19 countries), Percent Change, Monthly, Not Seasonally Adjusted" for Eurostoxx 50. Transaction costs have not been considered, though for the number of trades and the type of financial instruments traded are expected to be very low. Correlation to GPR variables have been considered as well, to check for any additional information that could be useful for this model. Data is summarised below.

Correlation coefficients	WT	MB	BW	HGPR
One month treasury rate	0,33	0,09	0,51	0,33
One month euribor mom	0,08	-0,22	0,35	0,03
Inflation rate US mom	0,13	0,21	0,10	0,15
Inflation rate EU mom	0,18	0,25	0,14	0,21

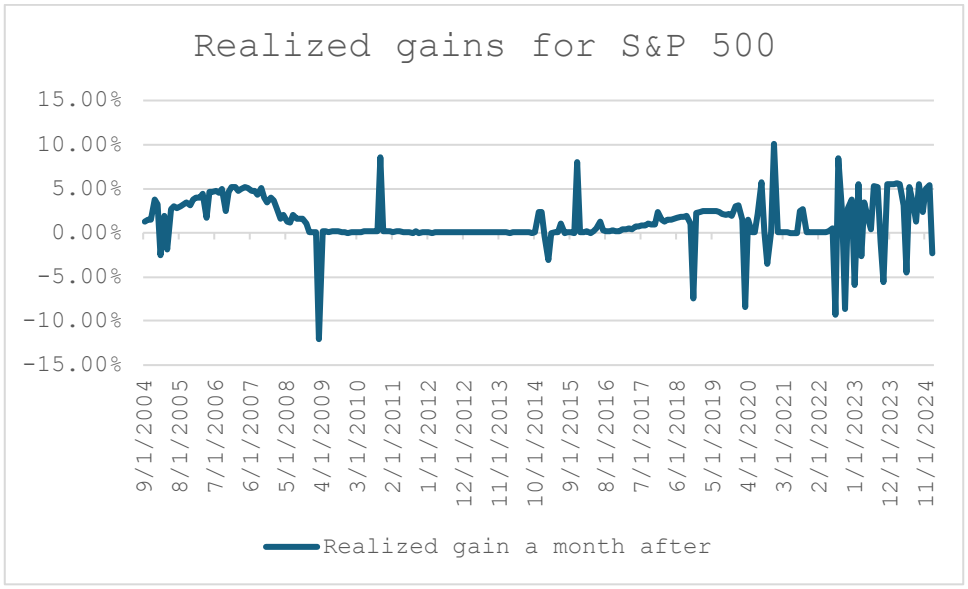
Source: table provided by the author

As it is possible to notice, no relevant relations were found, except for the positive relation between one month treasury rate and the beginning of war share of articles.

Now, we will dig deeper into the strategy and its implementation. Everything is based on the signals presented above. We computed the MA correlation of each index price with the variables described before. We then calculated a weight for each variable proportional to the strength of the correlation of that variable with the price time series. This way, we simulate an investor not being aware of what will be the future value of the independent variable or that of the price of the index analysed. Then, a single dummy variable was calculated multiplying each dummy of the single GPR variables with the respective weight. This way, we ensured that the proper variable would get the proper attention, avoiding overweighting and, most important, data snooping. Finally, a simple rule defines the position to be taken by the investor: if the overall value of the dummy variable is negative, indicating low geopolitical tensions, then a long position is taken on the index. The position is held for a month, after which log returns are computed with the next simple formula:

$$R_{t+1} = LN(\frac{P_{t+1}}{P_t})$$

If, instead, the general dummy has value lower or equal to 0, it indicates that geopolitical tensions are rising. As a consequence, we would expect markets to suffer and negative Abnormal Returns. Hence, the investor moves to riskless instruments, such as one-month T-bills, and gets the return of this investment on the next month. The Results are shown in the next graphs.


Realized gains for S&P 500
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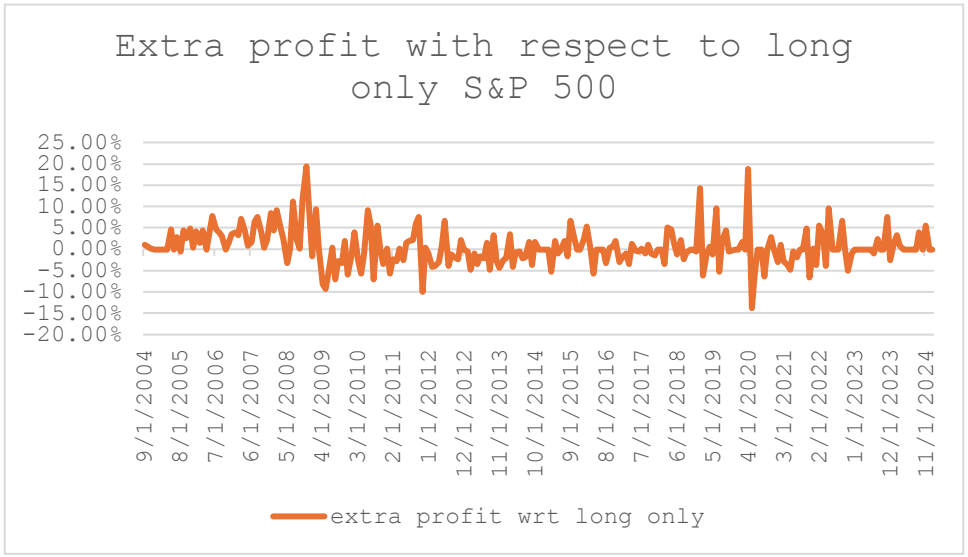
10.00%
5.00%
0.00%
-5.00%
-10.00%
-15.00%
9/1/2004
8/1/2005
7/1/2006
6/1/2007
5/1/2008
4/1/2009
3/1/2010
2/1/2011
1/1/2012
12/1/2012
11/1/2013
10/1/2014
9/1/2015
8/1/2016
7/1/2017
6/1/2018
5/1/2019
4/1/2020
3/1/2021
2/1/2022
1/1/2023
12/1/2023
11/1/2024
Realized gain a month after


Extra profit with respect to long only S&P 500
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20.00%
15.00%
10.00%
5.00%
0.00%
-5.00%
-10.00%
-15.00%
-20.00%
9/1/2004
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7/1/2006
6/1/2007
5/1/2008
4/1/2009
3/1/2010
2/1/2011
1/1/2012
12/1/2012
11/1/2013
10/1/2014
9/1/2015
8/1/2016
7/1/2017
6/1/2018
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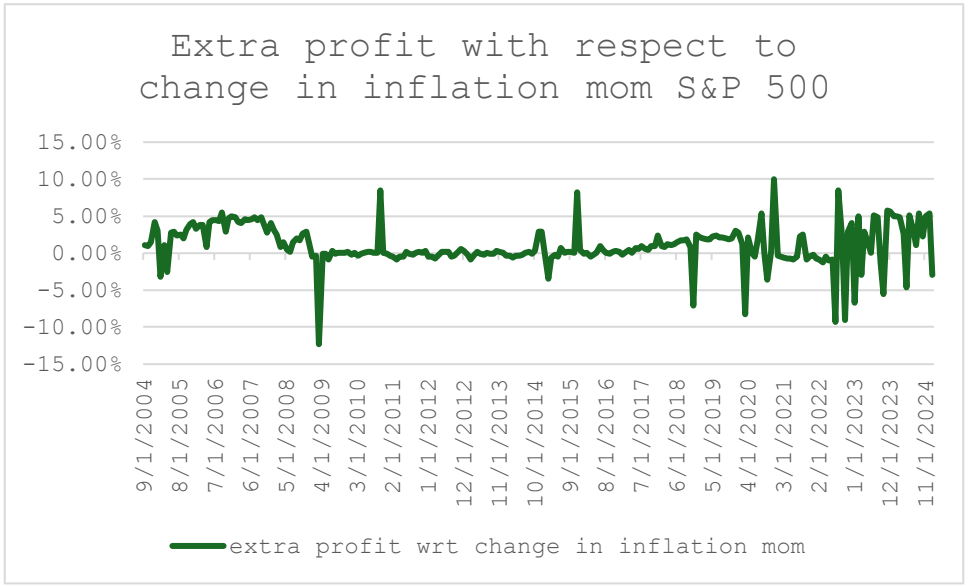
2/1/2022
1/1/2023
12/1/2023
11/1/2024
extra profit wrt long only


Extra profit with respect to change in inflation mom S&P 500
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5.00%
0.00%
-5.00%
-10.00%
-15.00%
9/1/2004
8/1/2005
7/1/2006
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5/1/2008
4/1/2009
3/1/2010
2/1/2011
1/1/2012
12/1/2012
11/1/2013
10/1/2014
9/1/2015
8/1/2016
7/1/2017
6/1/2018
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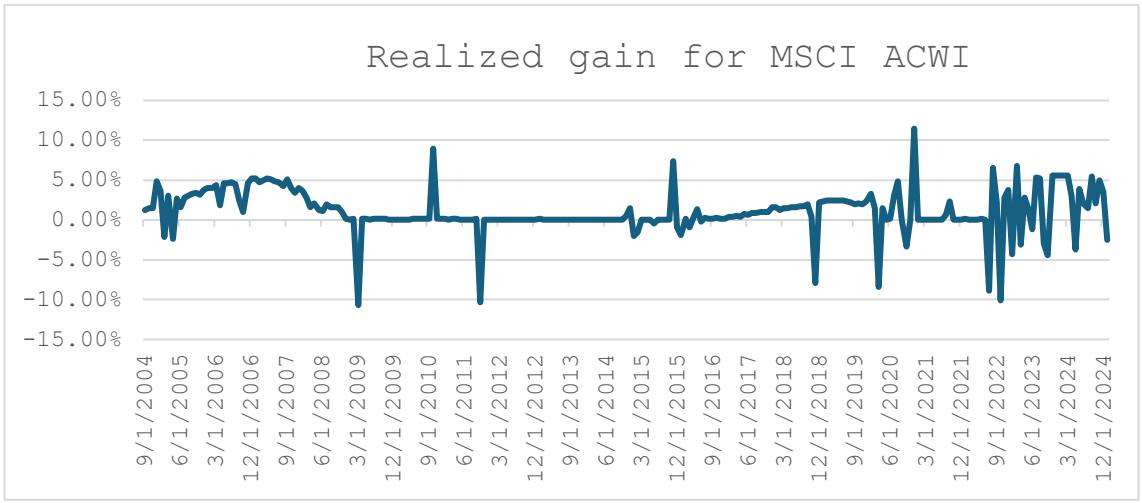
11/1/2024
extra profit wrt change in inflation mom


Realized gain for MSCI ACWI
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10.00%
5.00%
0.00%
-5.00%
-10.00%
-15.00%
9/1/2004
6/1/2005
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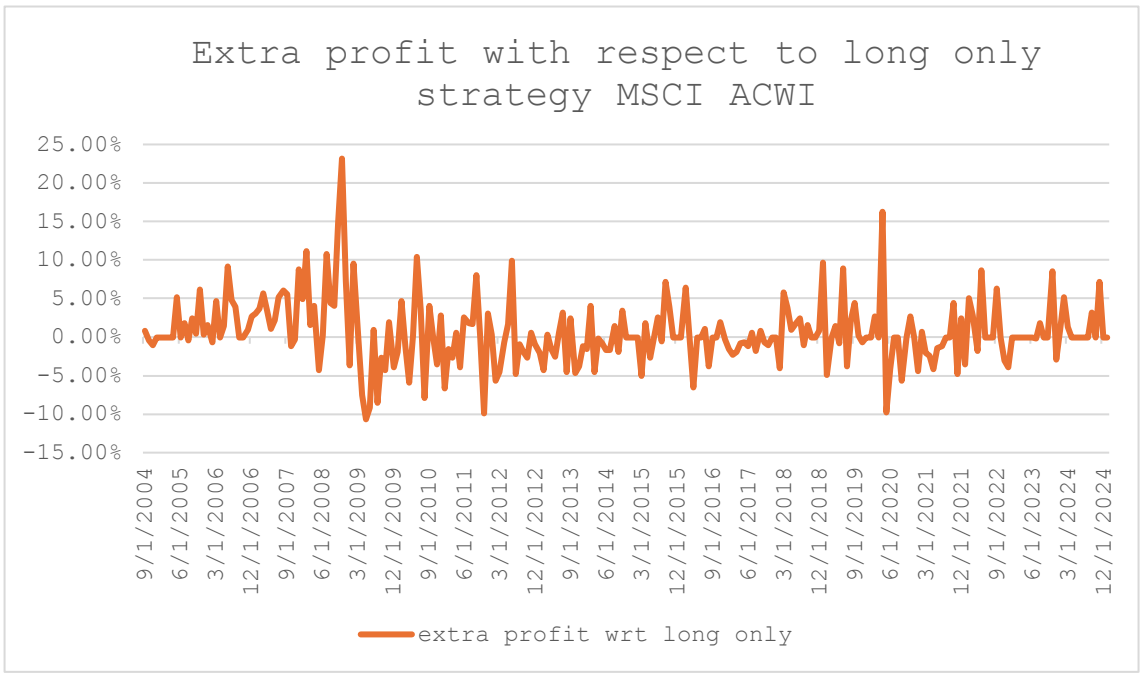
12/1/2024


Extra profit with respect to long only strategy MSCI ACWI
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20.00%
15.00%
10.00%
5.00%
0.00%
-5.00%
-10.00%
-15.00%
9/1/2004
6/1/2005
3/1/2006
12/1/2006
9/1/2007
6/1/2008
3/1/2009
12/1/2009
9/1/2010
6/1/2011
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6/1/2017
3/1/2018
12/1/2018
9/1/2019
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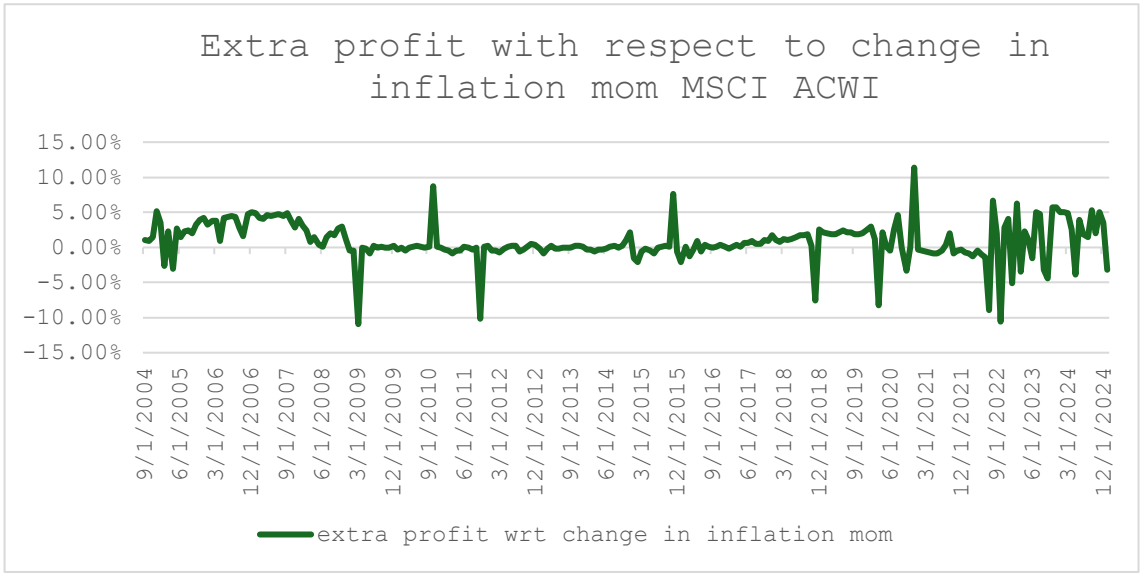
9/1/2022
6/1/2023
3/1/2024
12/1/2024
extra profit wrt long only


Extra profit with respect to change in inflation mom MSCI ACWI
15.00%
10.00%
5.00%
0.00%
-5.00%
-10.00%
-15.00%
9/1/2004
6/1/2005
3/1/2006
12/1/2006
9/1/2007
6/1/2008
3/1/2009
12/1/2009
9/1/2010
6/1/2011
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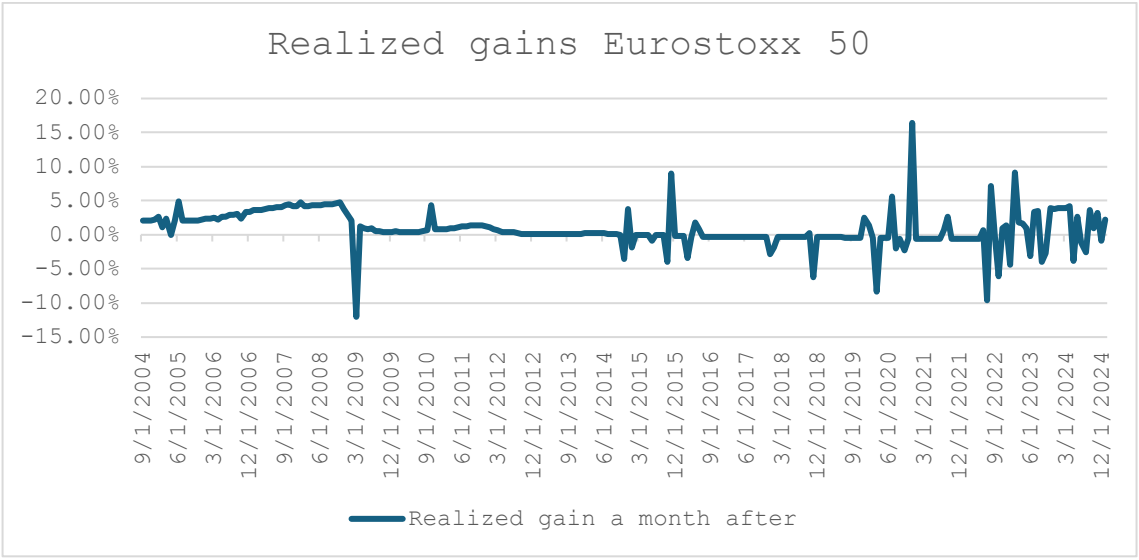
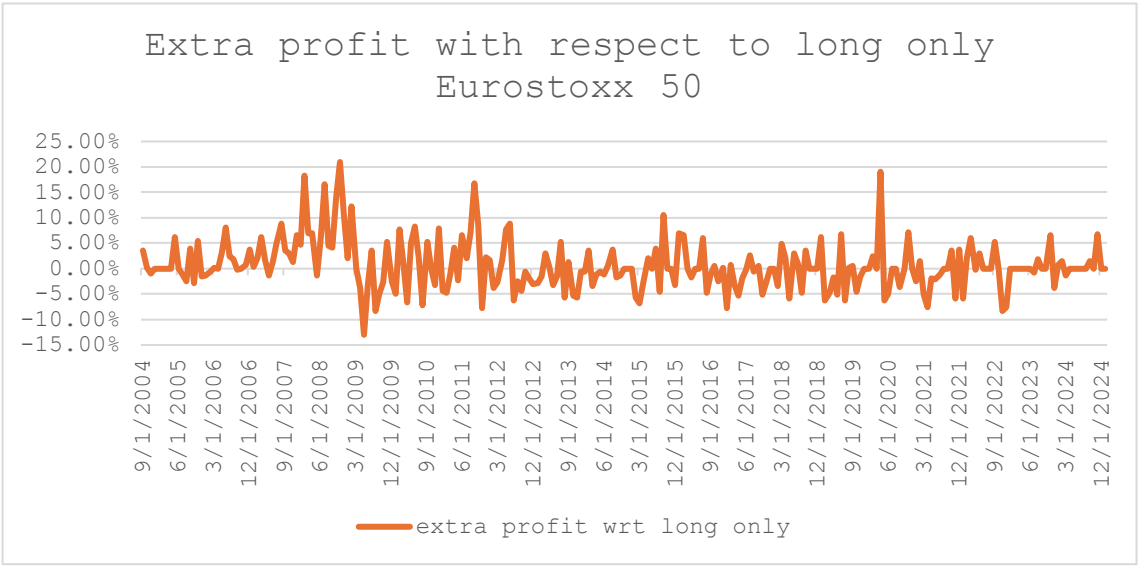
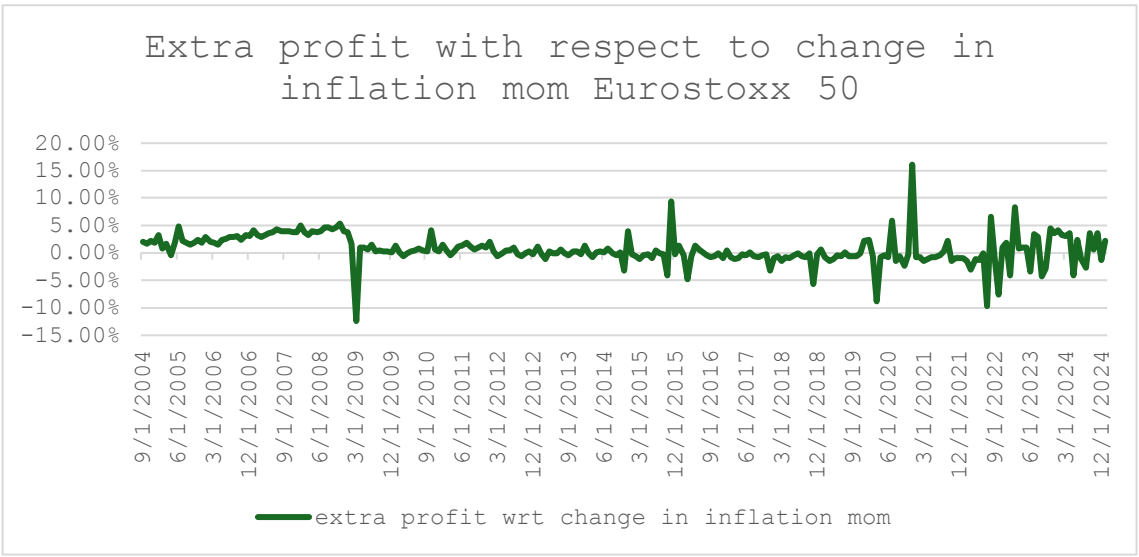
extra profit wrt change in inflation mom







Source: tables provided by the author

As it is possible to notice, returns tend to experience higher volatility from 2020 onward, likely due to great uncertainty in the markets and higher geopolitical risks. Another relevant observation is that, on average, GPR index was able to forecast the loss given to the Global Financial Crisis, but it was not able to exploit the rebound of March 2009, as seen on graphs. Finally, good results were obtained during Covid-19 Pandemic, as the three indexes accumulated negative AR in April. We also analysed the Sharpe and Sortino ratios, both normal and annualised versions. Even though results are negative, showing a small degree of higher returns compared to the risk embedded in this strategy, the overall investment shows higher return compared to the long only strategy on these indexes, indicating that potential for higher profitability is present, likely given by more refined parameters in signal generation. Last but not least, relevant information on the strategy have been collected in the tables below.

Chart Area

xx 50	
Years	20,33
Annual average	10,32%
Sum of gains and losses	209,84%
max gain	16,42%
Max loss	-12,03%
Number of observations	248
Sharpe not annualized	0,23
Sharpe annualized	0,07
Sortino ratio not annualized	0,27
Sortino ratio annualized	0,08

S&P 500	
Years	20,33
Annual average	14,73%
Sum of gains and losses	299,45%
Max gain	10,08%
Max loss	-12,06%
Number of observations	248
Sharpe not annualized	0,17
Sharpe annualized	0,06
Sortino ratio not annualized	0,26
Sortino ratio annualized	0,07

MSCI ACWI	
Years	20,33
Annual average	13,17%
Sum of gains and losses	267,88%
max gain	11,47%
Max loss	-10,68%
Number of observations	248
Sharpe not annualized	0,22
Sharpe annualized	0,06
Sortino ratio not annualized	0,29
Sortino ratio annualized	0,08

Source: tables provided by the author

Chapter 3: Chinese FDIs and Future Potential Conflicts

3.1 Drivers of FDIs

In the last two chapters we had the opportunity to look at how geopolitical events influence strongly equities and commodities markets. But effects don't stop there. Indeed, as we approach the third part of the work, another aspect of study comes to attention, that is, what are the effects of conflicts on Foreign Direct Investments? It is a relevant question if we consider the connected economies we are observing and the potential political interferences that FDIs may exert on governments, especially on policies. This was particularly the case for China, a country that has put great efforts in the last 10 years in ensuring strategic contracts worldwide for precious raw material and oil or by building infrastructures, such as ethernet cables, seaports and so on. We will first focus the analysis on what drives the decision for Chinese firms to invest abroad and, secondly, what are the ties with other economies and governments, such as Europe and United States.

For what concerns drivers, we have based our analysis on the work by Wang and Tao (2023) and Cheng and Dong (2024). They explore different aspects on what may be the causes for Chinese private-owned listed companies though somewhat coming to the same conclusion. It is important to remind that in these studies State-Owned Enterprises, or SOE, were not included. The reason is that most of the times these firms tend to experience better operations conditions, such as lower interest rates for debt, lower bureaucracy for land concession or lower rents for equipment, altering the results of the analysis conducted and not being suitable candidates to understand true drivers of FDIs.

Wang and Tao (2024) focused their work on understanding what could be the operational causes for enterprises from Chinese, and in general developing countries, to move outward and look for investments abroad. The reason behind such decision is often due to the presence of Factor Market Imperfections, given by three elements: first, a certain degree of information asymmetry that has led to incomplete development of the factor market; second, the existence of monopolies causes pricing systems to be distorted; third, government interventions do not allow

for the factor market to self-regulate, channelling resources away from efficient firms. They also introduce among the drivers of Outward FDI (OFDI) the "springboard effect", introduced by Luo and Tung (2007), explaining that firms in developing countries may be looking to "circumvent the constraints of the home country and acquire overseas assets to compensate for an operation disadvantage" (Wang and Tao, 2023).

In addition to this, financing in China may be inefficient, with higher interest rates for debt and inefficient capital markets, and land supplies constrained, as the allocation is decided by local governments. Thus, the authors hypothesize that OFDI may be caused by market constraints on enterprises.

The methodology used to prove this hypothesis was an OLS estimation of the presence of OFDI based on several control variables such as:

1) Firm size, in terms of employees.
2) Capital intensity, as total assets over total employees.
3) Debt, as the ratio of total debt to total assets.
4) Age, representing the years the firm has been operating.
5) Labor cost, as the natural logarithm of wages
6) Total Factor Productivity
7) Financing constraint as indicate in the SA index (Anri et al., 2021).
8) Pre investment as the number of investments made by the firm in the market.
9) Investments made by other industries on the same sector of the firm under analysis.
10) Herfindahl-Hirschman Index, describing the percentage of production the firm has in the market.

Results confirm the hypothesis of the authors, with Private Owned Enterprises experiencing higher financing costs and higher land costs, leading companies to OFDI. This was also confirmed by a comparison with SOE, where the latter resulted to have lower values for both variables.

When analysing the work carried by Cheng and Dong (2024), the results appear somewhat similar, as stated above: financing cost ends up being the main driver for OFDI for Chinese firms. The additional aspect that the authors add is the "Long Term Orientation", which indicates the willingness of companies and CEOs to act

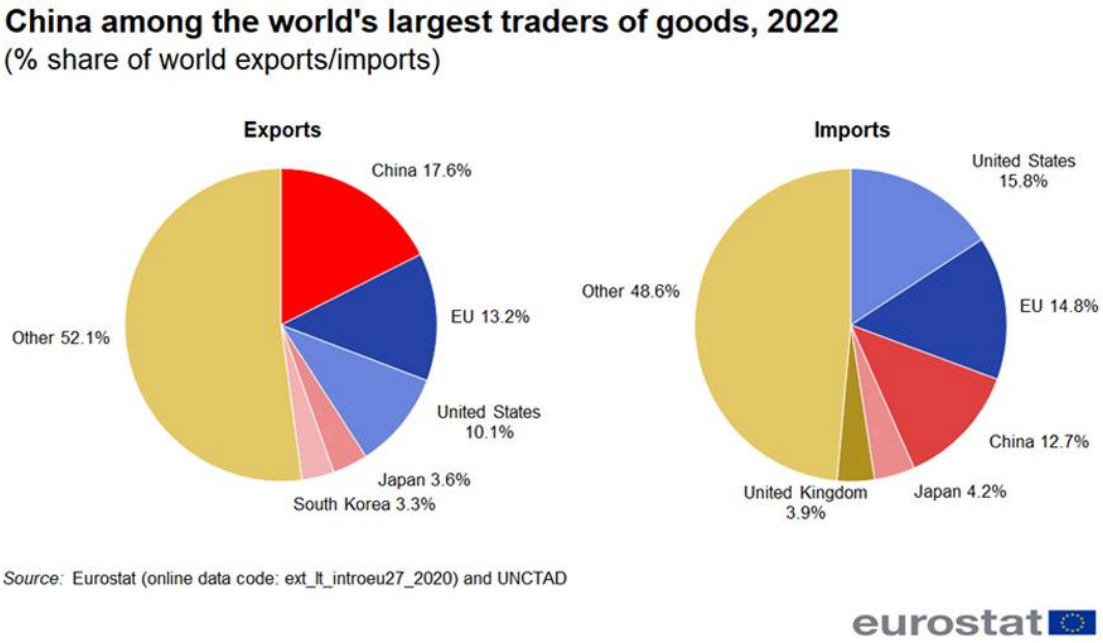
in long plans. Usually, this characteristic is associated with a low level of debt of the company, which, even if it allows for lower rates and thus better financing conditions, does not allow overall for competitive conditions, leading companies to look for OFDI.

The last driver analysed in this review has been deeply studied by Anderson and Sutherland (2015). They focused their research on the impact of Investment Promotion Agencies (IPA) on Chinese FDI in Canada. Indeed, companies operating abroad often incur in costs known as "Liability Of Foreignness" (LOF), as defined by Zaheer (1995) "all additional costs a firm operating in a market overseas incurs in that a local firm would not incur". For example, these may include unfamiliarity with the country or the government, absence of knowledge of specific laws to operate and so on. IPA thus help foreign firms in allocating FDIs, especially in mining and raw materials, such was the case for Canada. Additionally, these types of investments may lead to friction for the control of resources, as geopolitical consequences may be the loss of availability of such strategic material, or the dependences from other countries for essential services, as for example Chinese FDIs for internet underwater cables in Africa.

3.2 Chinese Imports and Exports

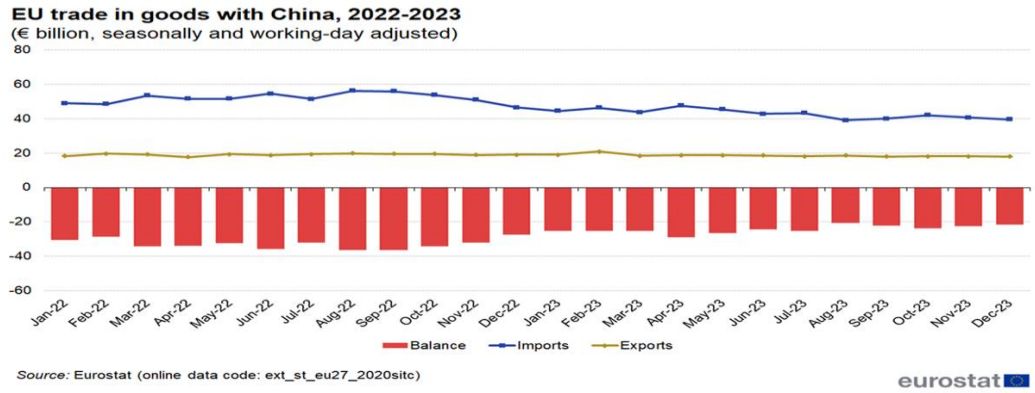
Once we analysed what are the drivers for Chinese FDIs, we will briefly discuss what is the relationship with other countries with respect to imports and exports of goods. This analysis will turn useful later, when we will analyse what could be the consequences of a potential conflict arising in the Pacific. Understanding now the equilibria taking place will give us a better view on weaknesses and dependences of European and U.S. markets from foreign products. For this scope, we will use the report produced by Eurostat on trade in goods.

The first aspect that can be notice is the fact that China is one of the biggest countries in terms of exports and imports, as shown in the graph below. Indeed, for year 2022, it stands at an impressive 17,6% of global exports, whilst for imports it represents the third country in the world, with 12,7% of imported goods globally.



Source and Data: Eurostat

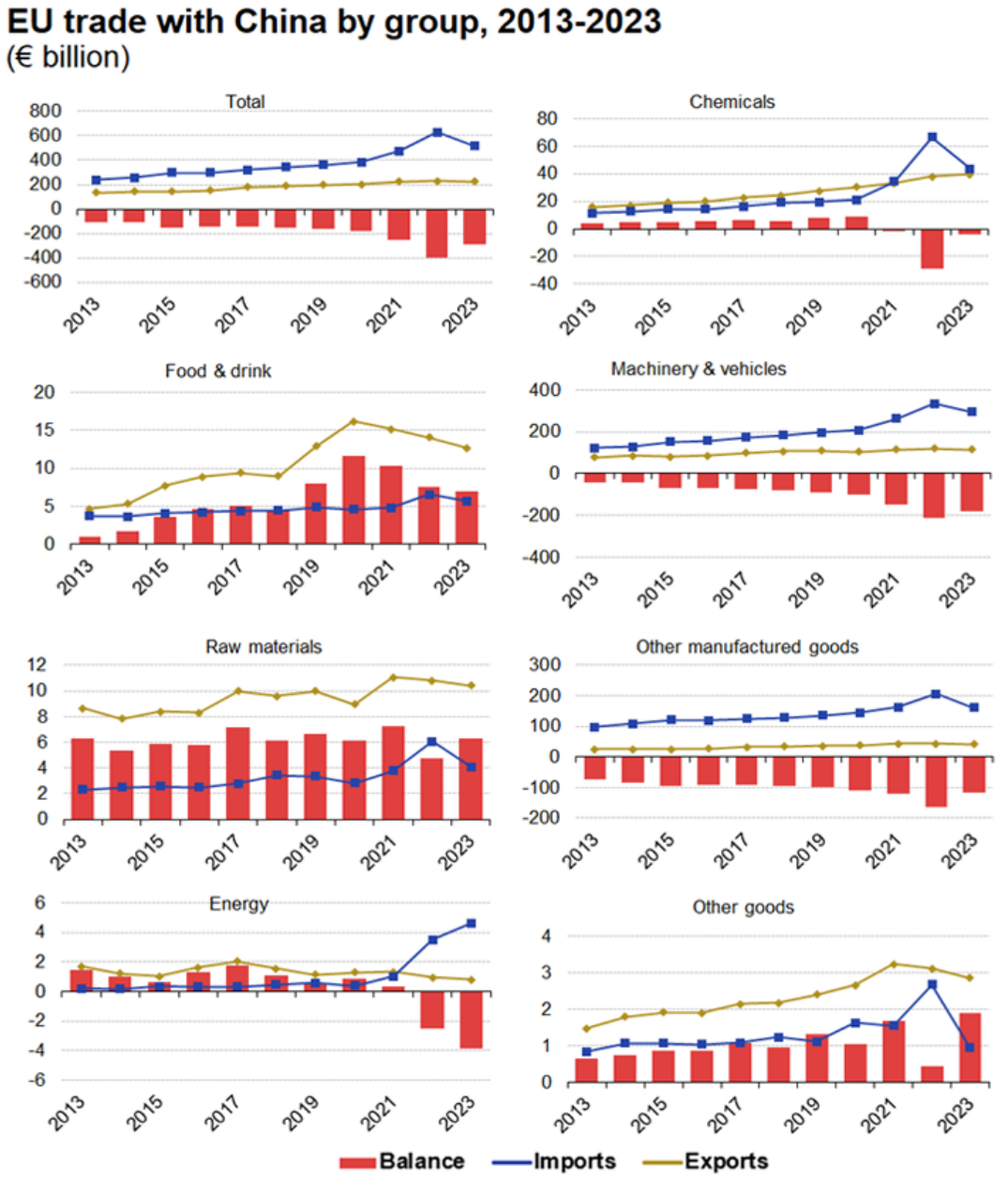
Looking at the main trade partners, we can notice a strong interdependence between China and EU. Indeed, Chinese imports make up 20,5% of total European imports, whilst amounting for 8,8% of goods produced in Europe and exported abroad. Balance has in fact a negative value, with about € 20 billion of net imports in December 2023. The graph below shows the balance of trade with China. We can notice an immediate increase in imports post conflict in Ukraine while European exports tend to stagnate and keep the same level overall.



Source and Data: Eurostat

This increase in exports is also represented by the series of graphs reported below. In all of them, conflict in Ukraine has acted as a relevant geopolitical event starting a flux of goods coming from China. Particularly interesting to notice is the case of Energy, Chemicals, where we moved from net exporters to net importers.

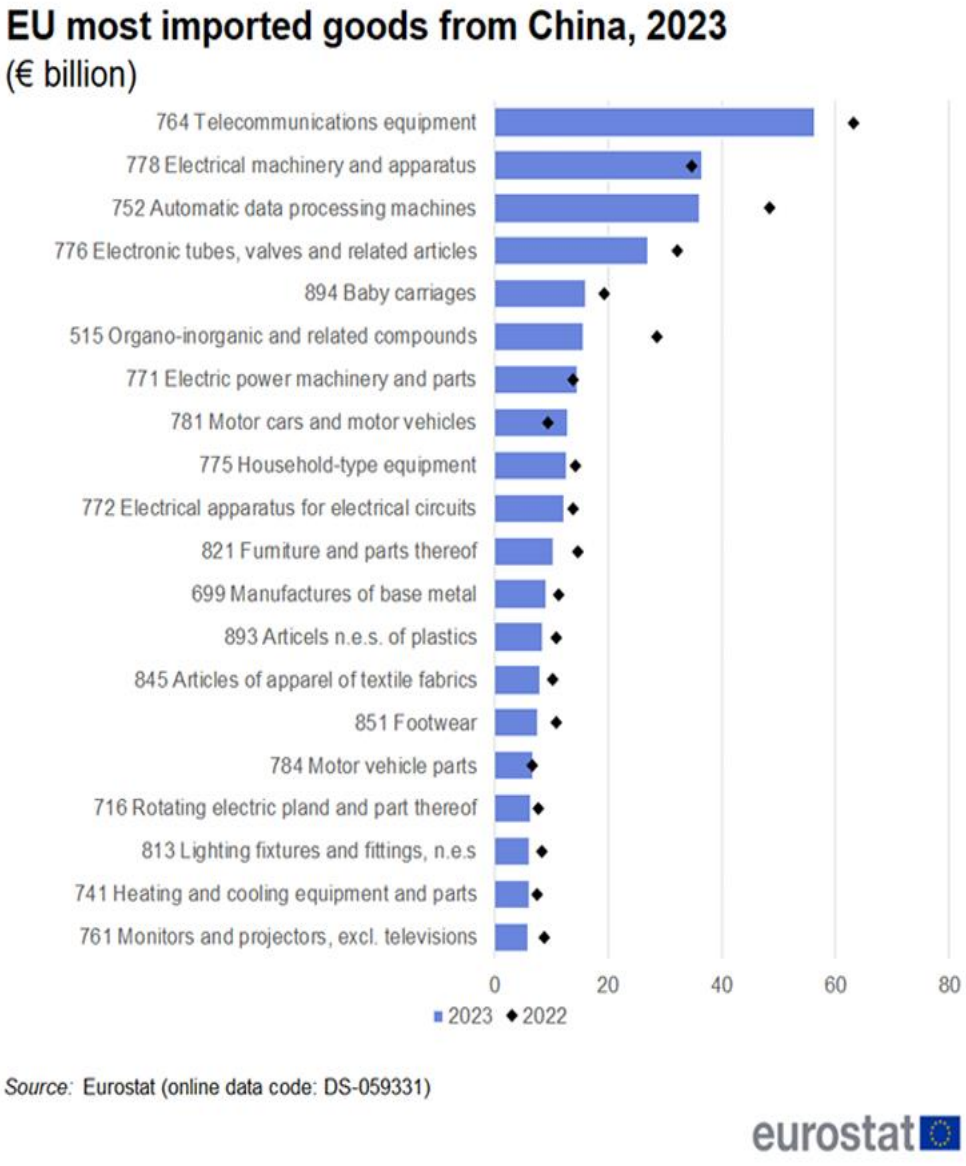
This is likely due to trade restrictions with Russia in 2022, as alternative energy sources were looked for.



Source and Data: Eurostat

Finally, it should be of concern the types of good imported from China. The graph below highlights that the biggest category is telecommunications equipment. This is extremely important, as it represents a strategic industry, especially nowadays where satellites communications and means used to transmit relevant

information may be dependent on Chinese product, hence on patents and systems not designed “in house”. The case is analogous to the recent one involving F-35 fighter jets (Scenari Economici, 2025), where a potential kill switch may lie in the avionics, the so called Autonomic Logistic Information System (ALIS) now known as Operational Data Integrated Network (ODIN), making this superb product a mere piece of steel and electronics.



Source and Data: Eurostat

3.3 Implications of a Potential Conflict

As we approach the end of this study, we will analyse the possibility of a conflict, specifically the one that could arise between China and Taiwan. Indeed, the latter is the main producer of semiconductors in the world. This product is essential for electronic components, from cars to computers and armaments. Thus, it represents a strategic industry to get a hold of. Additionally, disputes between continental People's Republic of China and the Republic of China have been a constant in the area, often causing heightened tensions. U.S. have tried to take a position in favour of Taiwan, at the same time keeping good diplomatic relations with China, as it represents one of the biggest U.S. trade partners. As the role of semiconductors in economies increased in importance, so did the will of continental China to take possession of the island, not being able to take military action due to the protection guaranteed by U.S. Nevertheless, geopolitical analysts believe a conflict is possible in the span of a few years, given that Chinese industries won't be able to get a grasp of the technological advancements discovered by Taiwanese firms. If we suppose such conflict would erupt, what could be the consequences at an economic level?

First of all, as experienced with war in Ukraine, we could expect high negative Abnormal Returns both on Taiwanese and Chinese equity markets, along with a progressive increase in commodities prices related to production in China, such as copper, aluminium, batteries, coal, soybean, rice, likely due to potential restrictions on trade. At the same time, countries such as Europe and U.S. would drastically reduce imports of goods from China, moving the demand to other suppliers. These states could, in turn, open new channels of trade with other areas in Asia, such as India. In addition to these shocks, defence industries could have higher AR on markets, especially the ones analysed in chapter one. Additionally, as war in Ukraine was somewhat forecasted by an increase in the index of war threats, we could build an expectation on the likelihood of it happening and using the strategy described in chapter 2, we could take position in markets pre-emptively.

Another relevant effect of such scenario could be the reduction in Foreign Direct Investments, especially on the Chinese side, as they have been allocated huge

capitals on infrastructures abroad. The application of economic sanctions and the military effort could cause the retreat of human capital as well, thus reducing the overall presence of China on strategic areas of the world, such as Sub-Saharan Africa, Eastern Africa (Somalia and Eritrea) and Middle East.

Conclusions

To conclude this study, we inferred that war in Ukraine, and in general geopolitical relevant events, constitute a source of uncertainty for markets, firms and governments worldwide. Nevertheless, a profound and deep analysis of the economic and financial conditions allow for an almost complete understanding of the possible directions to be taken. This logic works both for commodities markets, as seen in chapter 1, and for Foreign Direct Investments, as shown in chapter 3. Finally, chapter 2 provides a trading strategy that exploits geopolitical risks to achieve superior returns compared to long only investments on three indexes. Inflations has been considered as well, to provide a full picture on the efficiency of this instrument. Further improvements could be carried out, such as refining signal parameters based on the four GPR variables to produce more reliable inputs, as volatility in terms of geopolitical risk has increased dramatically since Covid-19.

All the considerations above arose from the observation of the conflict in Ukraine. Of course, it is preferred that such condition in the future would not happen. Nevertheless, humanity has a history for repeating errors. It is up to us to limit damages from such situations, both at a human and economic level.

References

Kausar Alam, Mosab I. Tabash, Mabruk Billah, Sanjeev Kumar, Suhaub Anagreh (2022), *The impact of the Russia – Ukraine Invasion on global markets and commodities: a dynamic connectedness among G7 and BRIC markets, Journal of Risk and Financial Management*

Adam Rose, Zehnhua Chen, Dan Wei (2023), *The economic impact of Russia-Ukraine war export disruption of grain commodities, Applied Economic Perspectives and Policy*

Xi He, Miguel Carriquiry, Amani Elobeid, Dermot Hayes and Wendong Zhang, (2023), *Impacts of the Russia-Ukraine conflict on global agriculture commodity prices, trade and cropland reallocation, Choices Magazine*

Victoria Ferràndez-Serrano, Pedro L. Angosto-Fernàndez (2022), *A Russian carol: impact and dependence on global equity markets during the Ukraine Invasion, Journal of Economic studies*

Antonio Miguel Martins, Pedro Correia, Ricardo Gouveia, (2024), *War!, Good news for defense firms? Analysis of the impact of Russia-Ukraine conflict, Journal of Economic Studies*

Sabri Boubaker, John W. Goodell, Dharen Kumar Pandey, Vineeta Kumary, (2022), *Heterogeneous Impacts of Wars on global equity markets: evidence from the invasion of Ukraine, Finance Research Letters*

Larisa Yarovaya, Nawazish Mirza, (2022), *The price reaction and investment exposure of equity funds: evidence from the Russia-Ukraine military conflict, The Journal of Risk Finance*

Bowen Cheng, Baomin Dong, (2024), *Long-term orientation and outward foreign direct investments: evidence from Chinese listed firms, The World Economy*

Kui Wang, Shuang Tao, (2023), *Why do Chinese private enterprises seek outward foreign direct investment?, China and World Economy*

Eurostat (2024), *China-EU International trade in goods statistics*

John Anderson, Dylan Sutherland, (2015), *Developed Economy investment promotion agencies and emerging markets foreign direct investments: the case of Chinese FDI in Canada, Journal of World Business*