

Sovereign Green Bond Market – A Comparative Analysis

Magdalena Mosionek-Schweda,¹ Monika Szmelter²

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Abstract

Green bonds have become basic instruments considered sources of green projects financing. The green bond market is relatively new as it was inaugurated in 2007, however, its rapid development has recently been observed. The aim of this paper is the analysis of sovereign green bonds, as well as the comparison and assessment of profitability, price changes and the structure of investors of these instruments. The analysis includes all green bonds issued by governments until the end of June 2018. The study adopted a hypothesis that there are significant differences in the parameters and yield of sovereign green bonds.

Keywords

green bonds; treasury bonds; bond yield; green projects

1 Introduction

The idea of sustainable development and sustainable economy has recently become a new paradigm discussed on the international forum uniting governments, international and national organisations, as well as the private sector in joint initiatives for environmental protection. As the transition to the sustainable economy needs enormous financial sources for environmentally-friendly projects, the idea of “green finance” has been promoted at the supranational level. Green projects need usually long-term financing

¹ PhD in Economics, Department of International Financial Markets, Institute of International Business, Faculty of Economics, University of Gdansk, Poland. She specialises in issues related to corporate finance, financial markets, including capital markets and stock exchanges. She is the author of approximately 100 scientific publications. Contact email: magdams@ug.edu.pl.

² PhD, Department of International Financial Markets, Institute of International Business, Faculty of Economics, University of Gdansk, Poland. She specialises in financial market and is the author of more than 20 scientific publications. Contact email: monika.szmelter@wp.pl.

and the bond market can provide an additional source of green funds to bank lending and equity financing. The green bond market emerged in 2007 with the first issuances offered by the World Bank and the European Investment Bank. Private sector issuers joined this market in 2013–2014, and since that moment the green bond market has been continuously increasing by around 120% yearly (Bieliński and Mosionek-Schweda, 2018: 14). The first sovereign green bonds were issued only at the end of 2016. The issuer of these instruments was Poland, thus entering the history of the development of the global financial market. One of the initiatives affecting the governments' decision to issue green bonds is undoubtedly the Paris Agreement within the United Nations Framework Convention on Climate Change (UNFCCC). The Agreement was signed by 195 parties (countries and organisations) on 12 December 2015 and entered into force on 4 November 2016. According to Art. 2 of the Paris Agreement, its aim is to support the global response to the threat of climate change by keeping a global temperature increase in the 21st century below 2 degrees Celsius. The enhancement of the countries' ability to manage with the impacts of climate change, as well as making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development are other goals of the Paris Agreement (Paris Agreement, 2015).

The aim of this paper is the analysis of sovereign green bonds, as well as the comparison and assessment of profitability, price changes and the structure of investors of these instruments. The research includes all green bonds issued by governments until the end of June 2018. For better understanding the origin of green bonds, the basic theoretical background of green bond was also provided. The study adopted a hypothesis that there are significant differences in the parameters and yield of sovereign green bonds issued by governments on foreign markets. A descriptive analysis was used to summarise the main characteristics of the analysed sovereign green bonds (namely the issuers, maturity profiles, denominated currencies, coupon). Additionally, a comparative analysis was adopted to assess differences between examined issuances.

2 Theoretical Background of Green Bonds

There is no one commonly accepted definition of green bond. Generally, a green bond is simply a fixed-income financial instrument sold on the market with a promise to devote the funds raised to environmentally-friendly projects. However, for further development of green bond markets, it is necessary to clearly state what green investments and green projects are, as well as to standardise rules and requirements relating to green bonds issuance. Among many of existing national and international standard frameworks used for labelling green bonds, the most popular are the Green Bonds Principles (released in 2015, updated in 2017) issued by the International Capital Market Association (ICMA). Those principles are entirely voluntary and should be seen as the guidelines for all green bond market participants. They also serve as the basis for many national frameworks. According to the GBP, green bonds are “any type of bond instrument

where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible Green Projects and which are aligned with the four core components of the GBP”. The GBP indicates also four basic types of green bonds: 1. Use of Proceeds Bond; 2. Use of Proceeds Revenue Bond; 3. Project Bond; 4. Securitised Bond (International Capital Market Association, 2017: 2–6).

It should also be mentioned a significant involvement of China in the development of the green bond market. In December 2015, the People’s Bank of China and the National Development and Reform Commission published two sets of guidelines for green bond issuance on the Chinese financial market. As a result, China becomes the first country in the world to publish official rules for the issuance of such bonds (Weber et al., 2016: 339). Moreover, the Chinese definition of green bond differs from other proposed definitions as projects including coal-powered generation, clean coal and high-efficiency transport fuel production are recognised as green in China (Dai et al., 2017: 13).

The diversity of green bond definitions and the lack of the standardised rules for certification of these securities reduce the transparency of the green bond market and, thus, are one of the biggest barriers for its development.

3 Governments as Green Bond Issuers

There are many factors that may influence sovereigns’ interest in issuing green bonds. Firstly, green bonds can be a key tool for governments to raise capital necessary to implement infrastructure plans in line with national climate targets made as the result of the commitments under the Paris Agreement. Thus, issuance of sovereign green bonds can provide a strong signal of the country’s commitment to a low-carbon economy. Moreover, by issuing green bonds, a government may reduce the cost of capital for green projects by attracting new investors interested in green investments. And finally, such governmental focus on green projects and green finance may mobilise the private capital towards sustainable development (Climate Bonds Initiative, 2018a: 2).

Although the beginning of the green bond market dates back to 2007 with the first issuances offered by the World Bank and the European Investment Bank, the first sovereign green bonds were issued only at the end of 2016. By the end of June 2018, barely 7 sovereigns decided to raise capital by issuing green bonds (see Table 1). The inaugural issue of sovereign green bonds was made by Poland in December 2016. In February 2018, the Polish Ministry of Finance offered another issuance of green bonds, as a result of which Poland once more became a pioneer in the financial markets – this time as the world’s first issuer placing the second issue of green bonds. In case of both issues, the investors’ demand significantly exceeded the issuance targeted by the Polish Government. The orderbook for the first Polish green bonds amounted to EUR 1.5bn while the planned issuance was worth EUR 500m. As a consequence, the final placement was up-sized to EUR 750m. This green bond issue contributed to the diversification of

the investor base investing in Polish Treasury bonds as 61% of the issues was acquired by investors specialising in investments in financial instruments related to environmentally-friendly projects. Geographically, 27% of the issues was purchased by investors from Germany and Austria, 17% from the Benelux countries, 16% from Great Britain and Ireland, 15% from the Nordic countries, 13% from France, 7% from Poland and 5% from other countries. Taking into consideration the types of investors, the largest share among investors was held by asset management companies (49%), followed by banks (22%), pension funds and insurance companies (16%), central banks and public institutions (12%) and other investors (1%) (Ministry of Finance, 2017: 5). Green bonds issued in second issuance were instruments with a tenor of 8.5 years and a coupon of 1.125%. Once more, the demand for Polish sovereign green bonds exceeded the issuer's expectations by reaching EUR 3.25bn, as a result of which the amount of the issue was doubled from the planned EUR 500m to EUR 1bn. About 40% of this issue was bought by investors specialising in investments in environmentally-friendly assets. The majority of investors came from Europe, including France (23.5%), Germany (19.0%), Great Britain (13.9%), Poland (9.6%), Switzerland (5.0%), Scandinavian countries (4.8%), Austria (3.9%), Benelux countries (1.9%), others (8.1%). Bonds were purchased primarily by asset management companies (66.5%), followed by banks (15.9%), central banks and public institutions (9.2%), and insurance companies and pension funds (7.8%), hedge funds (0.3%) and other entities (0.2%) (Mf.gov.pl, 2018).

The main purpose of both Polish issues was to finance environmentally-friendly projects consistent with the requirements set out in the governmental document entitled *Green Bond Framework* (The State Treasury of the Republic of Poland, 2016). However, no specific investments were pointed out. It was only indicated that the proceeds from the issue may be used to finance or refinance budget expenditures for green projects. Six eligible sectors were identified: renewable energy, clean transportation, sustainable agriculture operations, afforestation, national parks and reclamation of heaps.

One month after the pioneering Polish green bond issuance, in January 2017, the French Government joined the sovereign green bond market by issuing a 22-year maturing bond. Investors' demand for these instruments was very high with orderbooks closing at above EUR 23.5bn, leading the bond to be upsized from EUR 3bn up to EUR 7bn which is the largest and longest-dated green bond ever issued. The geographical distribution of investors shows strong domestic demand for these instruments as investors from France acquired 37% of the issuance. The share of investors from the Netherlands was 19%, the United Kingdom 18%, the Nordic countries 7%, Asia 3%, and America 2% (Agence France Trésor, 2017). Proceeds from these bonds were to be allocated to projects belonging to one of six eligible sectors: 14% of raised capital to energy, 33% energy efficiency, 20% transport, 3% waste, 23% sustainable land use and 8% adaptation.

In 2017 there were only two more sovereign green bonds issuances. At the end of the year Fiji and Nigeria placed their green bonds becoming the first issuers among developing economies. Nigeria's 5-year maturing bonds worth NGN 10.69bn

(USD 29.7m) are listed on the Nigerian Stock Exchange and FMDQ, an over-the-counter exchange. The proceeds would be used to provide green electricity to rural communities, improve education and support a government afforestation initiative (FinancialTimes.com, 2018b). It should be noted the very high coupon of these instruments set at the level of 13.48% and the lowest rating among the analysed instruments. In turn, Fijian's issuance worth FJD 100m (USD 49m) was divided into two tranches with 5-year bond maturing in 2022 with a coupon rate of 4%, and a 13-year bond maturing in 2030 with a coupon rate of 6.3% (Government of the Republic of Fiji, 2017). These instruments are listed on the London Stock Exchange. The purpose of the Fijian green bonds was to provide a new source of finance for sustainable development supporting particularly projects relating to the renewable energy, low-carbon transport and sustainable water supply.

Table 1. Details of sovereign green bond issuances

Country	ISIN	Nominal value	Coupon	Price (%)	Date of issuance	Maturity date	Tenor (years)	Rating
Poland	XS1536786939	EUR 750m	0.5%	993.43	20.12.2016	20.12.2021	5	A– (Fitch), BBB+ (S&P)
France	FR0013234333	EUR 7bn	1.75%	100.162	24.01.2017	25.06.2039	22	Aa2/AA/AA by Moody's, S&P, Fitch
Fiji	FJ0406990624, FJ0406990632	FJD 100m	5 years: 4.00%; 13 years 6.30%	100	17.10.2017	01.11.2022; 01.11.2030	5; 13	Ba3 (Moody's), B+ (S&P)
Nigeria	–	NGN 10.69bn	13.48%	1000	18.12.2017	22.12.2022	5	B+ (Fitch), B (S&P)
Poland	XS1766612672	EUR 1bn	1.125%	997.76	07.02.2018	07.08.2026	8.5	A– (Fitch), BBB+ (S&P)
Belgium	BE0000346552	EUR 4.5bn	1.25%	99.466	27.02.2018	22.04.2033	15	Aa3/AA/AA– by Moody's, S&P, Fitch
Indonesia	US71567RAJ59	USD 1.25bn	3.75%	100	01.03.2018	01.03.2023	5	BBB– (S&P), Baa2 (Moody's), BBB (Fitch)
Lithuania	LT0000610305	EUR 20m	1.2%	100	03.05.2018	03.05.2028	10	A (S&P), A3 (Moody's), A– (Fitch)

Source: Compiled by the authors based on Issue Letter No. 20/2018 of the Minister of Finance of February 5, 2018 regarding the issue of eight-year bonds with a fixed interest rate and maturity on August 7, 2026, offered on foreign markets; Letter of Issue No. 67/2016 of the Minister of Development and Finance of December 16, 2016 regarding the issue of five-year fixed-interest bonds and maturity on December 20, 2021, offered on foreign markets; FinancialTimes.com, 2018a and 2018b; Fmdqote.com, 2018; Globnewswire.com, 2018; data from Thomson Reuters Eikon on the basis of the agreement between the University of Gdansk and Thomson Reuters company.

In the first half of 2018, the green bond market expanded by four new sovereign bonds issues, including second issuance of Polish bonds, and three new issuers, i.e. Belgium, Indonesia and Lithuania. Belgium offered a 15-year maturing sovereign green bond with a total value amounted to EUR 4.5bn (the second largest in the analysed period). Investor demand was strong with an orderbook of EUR 12.7bn. According to the Belgian Debt Agency declaration, the EUR 4.5bn sovereign green bond is expected

to grow to EUR 10bn within four years (Climate Bonds Initiative, 2018b). Proceeds from these instruments would be used according to the Belgium's Green Bond Framework that aligns with its environmental commitments and policies by focusing on climate change mitigation and adaptation (96% of available eligible green expenditures), natural resource protection (3%) and biodiversity (1%). The Framework includes five eligible green sectors: energy efficiency, clean transportation, renewable energy, circular economy, and living resources and land use (Debtagency.be, 2018).

The Indonesian bond issue is, in turn, the first sovereign green sukuk³ on the green bond market.⁴ This issue allowed Indonesia to attract both: Islamic investors and green investors. The total size of the issue amounted to USD 1.25bn with a maturity of 5 years. Proceeds were allocated to projects which promote the transition to a low-emission economy and climate-resilient growth, including climate mitigation, adaptation and biodiversity. The eligible sectors are: renewable energy, energy efficiency, resilience to climate change/disaster risk reduction, sustainable transport, waste-to-energy and waste management, sustainable management of natural resources, green tourism, green buildings and sustainable agriculture (Climate Bonds Initiative, 2018b: 5).

The last sovereign green bonds issuance, in the analysed period, was the Lithuanian's offer of 10-year maturing bonds worth EUR 20m with a 1.2% coupon. It is also the first issue of government green securities in the Baltic region. Moreover, these bonds are quoted on the Nasdaq Baltic Bond List (Globnewswire.com, 2018). The funds raised by Lithuania are intended for modernising residential buildings to make them more energy efficient. The proceeds of the bond issue will be loaned to the Public Investment Development Agency which will in turn back subsidised loans to owners of multi-apartment buildings for building renovations (Imperial College Business School, 2018: 17).

The presented analysis of all issues of green bonds offered until the end of June 2018 showed a very large variation in the parameters of the issuance, i.e. coupon, maturity, value and currency of the issue. The common feature of all these instruments is the purpose of their issue: to finance green projects which address key environmental problems, such as climate change, depletion of natural resources, loss of biodiversity, air, water or soil pollution.

4 Comparative Analysis of Sovereign Green Bonds

The analysis is based on indicators such as: *current yield* (CY), *yield to maturity* (YTM), as well as bond prices. All data was derived from Thomson Reuters Eikon database which gives the access to real time market data (type of data used in research: *daily, last, mid*).

³ Sukuk are Islamic bonds structured in such a way as to generate returns to investors without infringing Islamic law that prohibits *riba* or interest. Commonly referred to as "sharia compliant" bonds.

⁴ The green sukuk were issued for the very first time by Tadau Energy which is a Malaysian company from the solar energy sector. The total value of the issuance amounted to MYR 250m. These bonds were offered in June 2017 with a tenor of 15 years.

Six green bonds quoted in Eikon were examined: FR0013234333, BE0000346552, LT0000610305, XS1536786939, XS1766612672, US71567RAJ59. The analysed period is the first half of 2018 because most of the examined green bonds were issued in 2018.

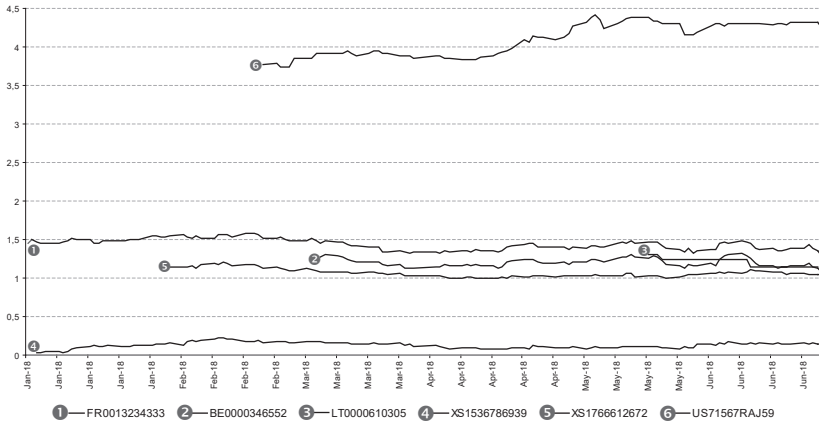


Figure 1. Yield to maturity (YTM) of the analysed sovereign green bonds (in %)

Source: Compiled by of the authors based on data from Thomson Reuters Eikon on the basis of the agreement between the University of Gdansk and Thomson Reuters company.

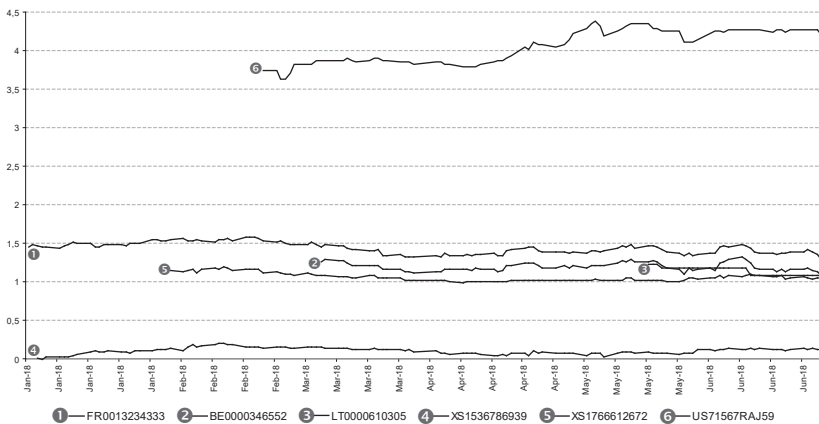


Figure 2. Current yield (CY) of the analysed sovereign green bonds (in %)

Source: Compiled by the authors based on data from Thomson Reuters Eikon on the basis of the agreement between the University of Gdansk and Thomson Reuters company.

There are significant differences in the level of the analysed indicators (see Figure 1 and Figure 2). The highest value was observed for Indonesia with YTM changes in 3.75–4.42% channel (CY: 3.64–4.38%). France is at the second place (yields fluctuated at the level of 1.44%) followed by Belgium, Lithuania, and Poland (XS1536786939) for which CY and

YTM were very similar. Securities issued by Poland are characterised by relatively low yield indicators (especially XS1536786939 green bond with average YTM at the level of 0.13%, and CY: 0.10%). Table 2 shows the maximum and minimum levels of YTM and CY in the analysed period. The biggest spread is observed for Indonesian securities.

Table 2. YTM and CY indicators (max, min, average, in %)

	FR0013234333	BE0000346552	LT0000610305	XS1536786939	XS1766612672	US71567RAJ59
Max YTM	1.59	1.32	1.30	0.22	1.20	4.42
Min YTM	1.29	1.08	1.15	0.03	1.00	3.75
Average YTM	1.44	1.20	1.21	0.13	1.07	4.10
Max CY	1.58	1.31	1.22	0.19	1.19	4.38
Min CY	1.29	1.07	1.07	-0.01	0.98	3.64
Average CY	1.43	1.19	1.13	0.10	1.05	4.06

Source: Compiled by the authors based on data from Thomson Reuters Eikon on the basis of the agreement between the University of Gdansk and Thomson Reuters company.

Price of green bonds changed with different dynamics (see Figure 3, Table 3 and Table 4). The most unstable was FR0013234333, for which the 1-day average change in price reached the level of 0.35% (max: 1.51%). On the other hand, the price volatility of XS1536786939 was relatively low with the average at the level of 0.05% (and max volatility was 0.19%). The spread (difference between max and min price) was the highest in case of the French bond (5.46), and the lowest in case of the Polish security XS1536786939 (0.79). Comparing all green bonds, we can divide them in two groups, i.e. a group of relatively variable securities consisting of French, Belgian, and Indonesian green bonds and a group with relatively stable securities including Polish securities. Changes in price of: FR0013234333, BE0000346552, US71567RAJ59 were clearly visible in the first half of 2018.

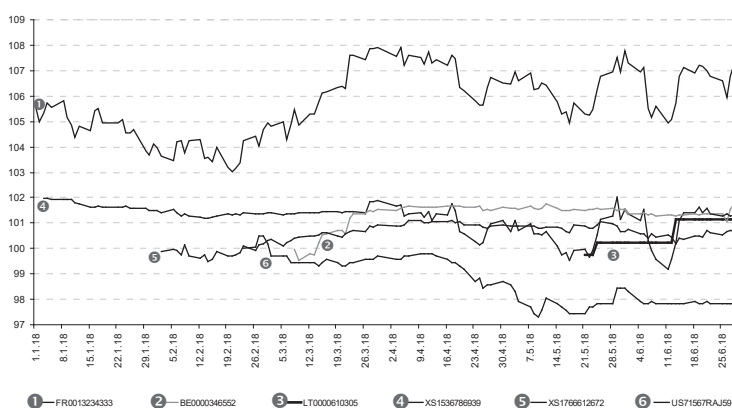


Figure 3. Fluctuations of the prices of the analysed sovereign green bonds

Source: Compiled by the authors based on data from Thomson Reuters Eikon on the basis of the agreement between the University of Gdansk and Thomson Reuters company.

Table 3. The price of green bonds (max, min, average)

	FR0013234333	BE0000346552	LT0000610305	XS1536786939	XSI766612672	US71567RAJ59
Max	108.48	102.42	101.17	102.00	101.12	100.50
Min	103.02	99.20	99.77	101.20	99.51	97.31
Average	105.76	100.84	100.59	101.50	100.56	98.69
Spread	5.46	3.22	1.40	0.79	1.62	3.19

Source: Compiled by the authors based on data from Thomson Reuters Eikon on the basis of the agreement between the University of Gdansk and Thomson Reuters company.

Table 4. 1-day dynamic in prices of green bonds (absolute value)

	FR0013234333	BE0000346552	LT0000610305	XS1536786939	XSI766612672	US71567RAJ59
Max	1.51%	1.18%	0.93%	0.19%	0.45%	0.64%
Average	0.35%	0.30%	0.06%	0.05%	0.09%	0.12%

Source: Compiled by the authors based on data from Thomson Reuters Eikon on the basis of the agreement between the University of Gdansk and Thomson Reuters company.

The analysed green bonds were purchased mostly by asset management companies located in the European Union (i.e. the UK, Denmark, Germany, France, Netherlands), Switzerland, United States, Hong Kong and Singapore. Table 5 shows the most important investors for each green bond. Financial institutions having almost all types of analysed green bonds are capital groups: BlackRock, BNP Paribas and Deutsche. The green bond issued by France has the most diverse holding structure as it is included in portfolios of almost 90 managing firms. The Indonesian bond is characterised by a limited number of investors (around 20 managing companies). The Belgian green bond is included in the portfolio of 40 managing firms, and the Polish in 35.

Table 5. The holding structure of the analysed sovereign green bonds

	FR0013234333	BE0000346552	XS1536786939	XSI766612672	US71567RAJ59
Name of the managing firms	External Manager Not Disclosed (North America) The Vanguard Group, Inc. (the US) BNP Paribas Investment Partners (France)	Fidelity Worldwide Investment Ltd. (the UK) External Manager Not Disclosed (North America) Schroder Investment Management Ltd. (SIM)	Union Investment Privatfonds GmbH (Germany) Deka Investment GmbH (Germany) First Private Investment Management KAG GmbH (Germany)	External Manager Not Disclosed (North America) BlackRock Investment Management Ltd. (the UK) Anima SGR S.p.A. (Italy)	Pictet Asset Management Ltd. (the UK) External Manager Not Disclosed (North America) Vontobel Asset Management AG (Switzerland)
No. of managing firms	87	42	36	35	21
No. of funds/portfolios	283	123	59	78	42

Source: Compiled by the authors based on data from Thomson Reuters Eikon on the basis of the agreement between the University of Gdansk and Thomson Reuters company.

The size of a bond issue often determines the number of managing firms and number of funds/portfolios managed by them. Thus, the French green bond is included in over 280 portfolios/funds, and the Belgian bond is present in over 120 portfolios/funds. Comparing securities issued by Poland, they are constituents of a limited number of portfolios/funds (around 60 in case of XS1536786939, and 80 for XS1766612672). Indonesian green bonds are only in 42 portfolios/funds. The average number of funds/portfolios at single managing firm range from 1.6 (XS1536786939) to 3.3 (FR0013234333). This indicator is around 3 for French and Belgian bonds, and 2 for the Polish security XS1766612672, as well as for the bond issued by Indonesia.

5 Conclusion

The above analysis confirmed significant differences in the profitability and the main features of sovereign green bonds issued in 2016–2018. The coupon of examined bonds ranged from 0.5% to 13.48%, the maturity was from 5 up to 22 years, and the total value of raised capital ranged from EUR 20m to EUR 7bn. Those instruments also differed considerably while indicators like YTM, CY, or price, as well as investors structure were considered. The highest and the most fluctuated yield indicators (YTM and CY) were for Indonesian bonds. Other green bonds have indicators on a similar level. As a consequence, there are observed differences in changes of green bond prices. Polish securities were characterised by relatively low volatility, and the French bond was the most unstable. Green bonds were bought by international financial institutions that come from developed markets. Some of the managing firms invested in securities issued by almost all analysed countries.

The sovereign green bond market is at the early stage of development. However, bearing in mind the global commitment to shift to a sustainable economy, the continuous growth of this market should be expected in the nearest future.

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