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A Market for Brown Assets To Make Finance Green

By Laura Cerami and Domenico Fanizza

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A Market for Brown Assets To Make Finance Green

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ABSTRACT: This paper proposes a market solution to enhance the role of the financial sector in the green transition. Developing a secondary market for "brown exposures" can allow banks to dispose more quickly of stranded assets thereby increasing their capacity to finance green investments. Furthermore, newly created instruments – the brown assets backed securities (B-ABS) - can expand the diversification opportunities for specialized green investors and, thus, attract additional resources for new green investments. The experience of the secondary market for non-performing loans suggests that targeted policy and regulatory measures can simultaneously support the development of the secondary market for brown assets and green finance.

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WORKING PAPERS

A market for brown assets to make finance green

Prepared by Laura Cerami and Domenico Fanizza[1]

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1. Introduction

The COVID pandemic has marked a turning point in the global push to address climate change. The sharp drop of carbon emissions recorded during the shutdowns, particularly in the most densely populated and heavily industrialized regions, provided a stark picture of the extent to which human activity affected the atmosphere directly and, climate change indirectly[2]. Emissions rebounded very rapidly soon after the end of the lockdowns, reaching nearly pre-pandemic levels well before the full reopening of the economy. Thus, it is just not practical to cut emissions by reducing activity in the industrial and residential sectors using the existing energy infrastructure. Reducing emissions permanently will require the transition of these sectors to low-carbon-emitting technologies.

This conclusion from the pandemic reinvigorated the public debate around climate change policies ahead of the United Nations Climate Change Conference - COP26 Summit (Glasgow, 2021), which confirmed the commitment, enshrined in the Paris Agreement (2015), to keep the global temperature rise well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. In addition, the signatories of the Glasgow Climate Pact committed to publish updated plans to cut greenhouse gas emissions by 45 per cent by 2030 and to contribute to the net-zero goal by 2050.

Achieving the committed global decarbonization goals will require a substantial surge in investments above historical levels and most recent trends. Current estimates range around staggering figures, although subject to a very high degree of uncertainty reflecting the novelty of the models and the long projection horizons. For example, according to McKinsey (2022), achieving net-zero emissions by 2050 would require about 275 trillion U.S. dollars in cumulative spending on physical assets, or approximately 9.2 trillion dollars per year, over the next three decades. In the European Union alone, the investment needs are estimated at 28 trillion euros (McKinsey, 2020).

Because of the potential downside risks from a climate strategy focused exclusively on green activities, this paper puts forward a more balanced approach that considers the need of promoting both the dismissal of carbon intensive technologies, and the development and adoption of clean technologies. Specifically, this paper proposes the launch of a secondary market for brown assets resulting from the securitization of banks exposures to carbon intensive activities, as a means of on the one hand, mitigating the risks from elevated stranded assets and increasing banks' available capital to extend credit for greening the economy, and on the other hand, providing better risk-return opportunities to dedicated green investors, and thus possibly making more financing available for the energy transition than otherwise.

The remainder of the paper is structured as follows. In section 2, we describe recent developments and current trends and challenges for green finance. In section 3, we present the case for a secondary market for brown assets from the supply-side perspective, based on a stylized bank model of exposures and exploiting the outcome of the European Banking Authority (EBA)'s climate risk mapping exercise[3]. In section 4, we explore the potential demand for securitized brown assets from the point of view of a dedicated green investor. In section 5, we examine the role for policies to support the development of a secondary market for brown assets.

[2] Laughner J.L., Neu J.L., Schimel D., and Zeng Z., Societal shifts due to COVID-19 reveal large-scale complexities and feedbacks between atmospheric chemistry and climate change. Proceedings of the National Academy of Science USA. 2021 Nov 16;118(46): e2109481118. doi: 10.1073/pnas.2109481118.

[3] European Banking Authority (2021). *Mapping climate risk: Main findings from the EU-wide pilot exercise*, EBA/Rep/2021/11, 21 May 2021.

Lastly, section 6 summarizes the main conclusions and highlights the potential benefits of the proposed market for brown assets.

2. Trends and challenges for green finance

The public sector is expected to play a key role in the green transition. Seizing on the opportunity to support the recovery from the pandemic as well as on the need to strengthen energy security and resilience in response to the economic fallout of the conflict in Ukraine, many countries are increasing public investment in clean energy and infrastructure. In Europe, for example, the majority share of the national Recovery and Resilience Plans, supported by European funds (NextGenerationEU), will be spent to accelerate the green transition.

The private sector, particularly the financial sector, will have to complement public investments and provide the bulk of the required resources. The range, size, and depth of financial instruments to channel private capital toward green initiatives have expanded rapidly in recent years. Green bond issuance volume in Europe increased by 90 per cent from 2020 to reach 252 billion euros in 2021[4], on the back of a more prominent participation of sovereign and supranational issuers. In the same year, green bonds constituted about 11 per cent of total European bond issuance. The total outstanding volume of green bonds at the end of 2021 reached about 700 billion euros. These bonds were predominantly issued by investment grade corporates in the form of plain vanilla fixed coupon bonds with a maturity of up to seven years and denominated in euros.

There has also been a growing interest in sustainable-linked and transition bonds. The formers are performance-based bonds with payments contingent on key performance indicators aligned with a sustainability strategy. Transition bonds are proceed-based like green bonds but have a narrower scope, as they are typically issued by carbon intensive companies to start greening their operations. Finally, the green securitization market, although still small, has also recorded a remarkable growth in 2021, with a total issuance of about 4.5 billion euros.

Green capital markets are complemented by the supply of green-linked loans, which partly contributed to the development of green securitization.

Despite the rapid development of green finance, the funding shortfall remains alarmingly large. In 2021, green-liked bond and loan issuance volumes amounted to about 450 billion euros, only a half of the annual investment needs to achieve carbon neutrality by 2050 in Europe.

Banks remain the main source of external financing for the European private sector and are playing a key role in green finance by issuing green-linked loans, bonds (whose proceeds are intended to extend loans for green projects), and asset-backed securities resulting from the securitization of green loans. However, according to the findings of the first pilot exercise conducted by the European Banking Authority (2021) to map climate risk in the European Banking sector, only 25 per cent of the total submitted notional exposure covered by the EU taxonomy are identified as green. Moreover, the green asset ratio, that is the primary indicator of greenness proposed by the EBA for the disclosure by banks is estimated at just 7.9 per cent. According to the mapping exercise, more than half of banks' exposures (58% of total non-SME corporate exposures to EU obligors) are allocated to sectors that might be sensitive to transition risks. These findings clearly show that greening banks' balance sheets is still a far distant goal.

[4] Association for Financial Markets in Europe - *AFME (2021). ESG Finance Report, European Sustainable Finance, Q4 and 2021 Full Year*.

Environmental, social, and governance (ESG) investing has the potential to accelerate the journey to achieve climate change goals, even though the evidence is not conclusive, partly reflecting the absence of a regulatory framework, that might mitigate the risk of greenwashing and incentivize compliance with firms' declared commitments to greening their activities[5].

From this perspective, recent progress towards the adoption of common taxonomies of green activities, such as the EU taxonomy, and related disclosure and reporting requirements for the corporate and the financial sector can help mitigate the risk of greenwashing, which constitutes a major obstacle to a more rapid expansion of green finance.

Other policies and regulatory measures can provide further incentives to green investments and attract private capital. However, some of the envisaged policies or their specific design, might also have the unintended consequence of increasing the cost and, hence, reducing the supply of private capital for green projects. For example, a sharp increase in carbon prices to achieve the emission reduction targets would hit firms that have heavy carbon footprints, leading to higher defaults, which would result in impaired credit quality for the banks exposed to those firms[6].

This example shows how climate policies by narrowly focusing on the green economy at the expense of carbon-intensive infrastructure and activities might accelerate the depreciation of brown assets over much shorter periods of time than feasible to ensure a smooth and efficient transition. The emergence of the so-called *stranded assets* is a challenging risk to manage for the financial sector, and to duly consider by policy makers in the design of climate policies. As first underscored by H.-W. Sinn in his provocative book, The green paradox (2008), today it is widely accepted the view that climate change policies aimed at curbing consumption of fossil energy can have the opposite unintended effect of accelerating the production of fossil energy and, thus, climate change. A more pragmatic approach to mitigation, on the other end, might be more effective.

3. The case for a secondary market for brown assets: a supply-side perspective

Banks are expanding their green assets portfolios but starting from a very low level, presumably on account of both demand and supply constraints. On the demand side, bankable green projects might still be limited, albeit are expected to grow in response to the global push to climate action, which has more recently been reinforced by growing concerns over energy security. In the current environment, it is reasonable to expect a lasting increase in fossil fuel prices and a weakening profitability trend for business activities with high-carbon content. Public policies, such as carbon pricing, may further tilt lenders' appetite towards green investments. On the supply side, banks might be capital constrained because of strict capital requirements and the legacies of past crises, most notably the unwinding of pandemic-related support measures. However, macroprudential measures, such as the so-called *brown penalizing factor* (i.e., higher risk-weight in capital requirements for carbon-intensive assets) and conversely a *green supporting factor* that adjusts capital requirements for green bonds, may ease balance sheet constraints.

[5] For instance, Elmalt et al. (2021) find a weak relationship between emissions growth and ESG scores, with firms with better scores displaying only somewhat slower emissions growth.

[6] Climate stress tests conducted by banking supervisory authorities have found a material, albeit manageable, impact.

In our model, we focus on supply constraints and assume that to rebalance their portfolios towards green assets, banks can only stop rolling over their brown exposures and invest the proceeds into green projects. In contrast, green exposures coming to maturity are reinvested in the same (rolled over) or other green projects.

Our objective is to simulate the time path that would rebalance banks portfolios towards green assets under the described strategy, which we label as passive rebalancing. To this end, we assume that all exposures can be split into two broad categories, green and brown, where the formers are defined in line with the EU taxonomy as applied in the EBA pilot exercise, while all other exposures are considered as brown.

For the purposes of our simulation, we set the end point at an equally balanced portfolio between brown and green assets, intended as a purely illustrative example. In fact, the optimal mix will vary across banks depending on their business model, policies, and risk management frameworks.

Under the above assumptions, the evolution of the brown and the green portfolios, can be described by the following laws of motion:

$$B(t) = B(t-1) * (1+r-\delta) \quad (1)$$
$$G(t) = G(t-1) * (1+r) + \delta * B(t-1) \quad (2)$$

In equations (1) and (2), B and G are the total brown and green exposures submitted in the EBA climate risk mapping exercise, and t is the standard time variable. Both brown and green assets earn a yield r, that we assume equal to the return on financial assets calculated from the EBA Risk Dashboard (September 2021). Brown assets are amortized at the rate δ, which is proxied by the quarterly growth rate of net loans to non-financial corporations in the euro area (average 2018-2021).

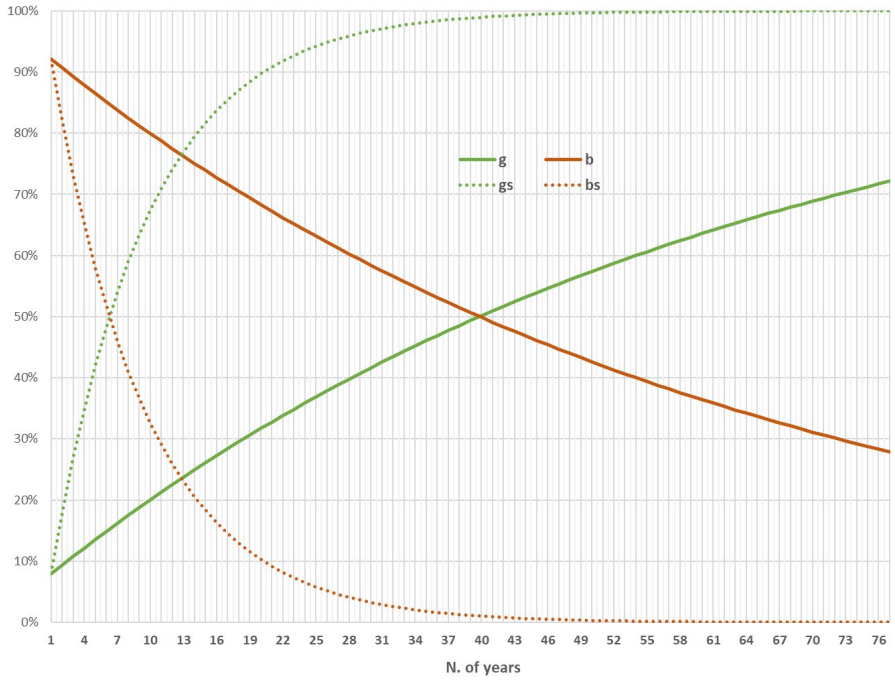
We are conscious that the assumption of constant and equal returns for brown and green assets might be very far from the reality, not least because of the expected impact of the green transition and policies to support this transition on the profitability of activities and assets with different carbon content. However, from this perspective, our assumption has the advantage of delivering a conservative estimate of the time required for greening banks' balance sheets. Moreover, the empirical evidence, although limited, in favor of the "greenium" does not justify assuming that green assets yield higher returns than brown ones.

As an initial condition, ewe compute green exposures based on the total exposures submitted to the EBA exercise and the calculated green asset ratio of 7.9 per cent[7].

Our simple simulation shows that it would take about 40 years to bring the green assets ratio from the initial value of 7.9 per cent to 50 per cent, under the passive rebalancing strategy described by equations (1) and (2), as shown by the solid lines in figure 1. The simulation starts from the snapshot of European banks' balance sheets submitted to the EBA climate exercise.

[7] In the EBA exercise, the green asset ratio is calculated as the ratio of EU taxonomy-aligned exposures to taxonomy-eligible exposures.

Figure 1. Greening banks portfolios: passive vs active rebalancing
(time to balance brown and green exposures)



Our next step is allowing the banks to offload a portion of their brown exposures through their securitization and sale in the secondary market for brown assets. Banks can now dispose of their brown assets on the market. Therefore, we focus on the dynamics of an alternative rebalancing strategy, which we define as active rebalancing, whereby banks can increase their green exposures by investing the proceeds from the sale of securitized brown assets in addition to those from maturing brown exposures.

Under the active rebalancing strategy, the dynamics of the shares of brown and green exposures can be represented as follows:

$$B(t) = B(t-1) * (1+r-\delta-s) \quad (3)$$

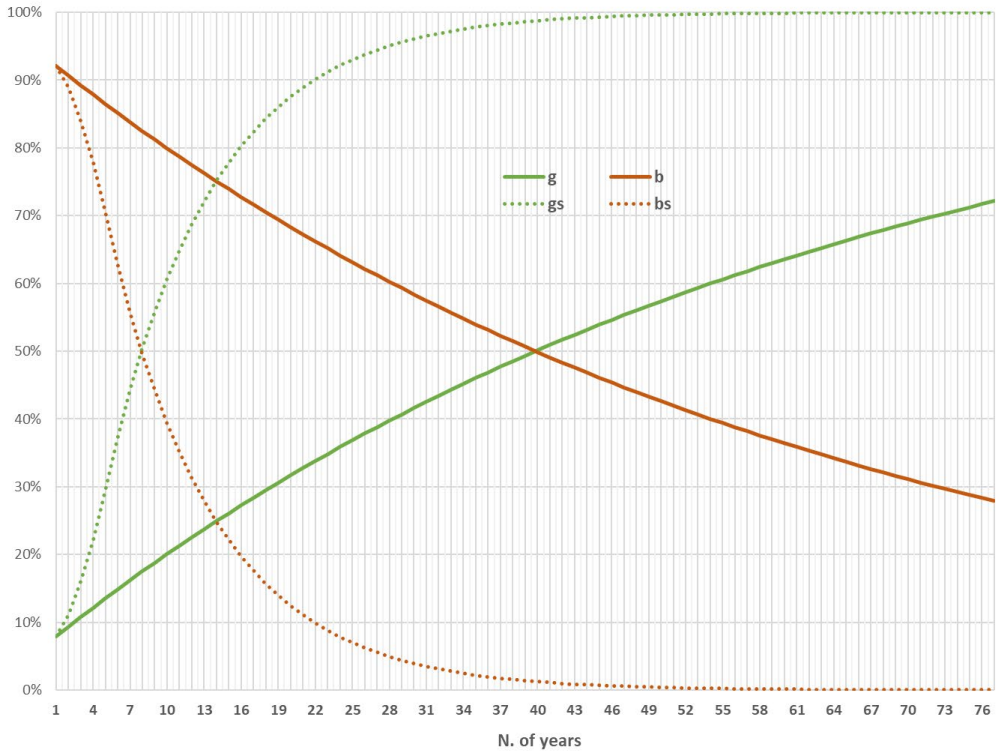
$$G(t) = G(t-1) * (1+r) + (\delta+s) * B(t-1) \quad (4)$$

where the only new variable, s, is the share of brown assets disposed on the market. The potential benefit of the market for brown assets as a means of accelerating the greening of banks' balance sheets and, hence, increasing the resources to finance the transition to a green economy, will critically depend on the evolution of this market and its depth. In this respect, it is important to notice that the new instruments backed by brown assets are not intended to provide fresh financing to brown activities but to support the phase-out of the existing capital stock that relies on dirty or brown technologies and its replacement with green capital.

Based on the experience from the secondary market for Italian non-performing loans (NPL), we assume that banks might be able to dispose 10 per cent of their total brown exposures on an annual basis. This level corresponds to the average share of Italian NPL sold over the period from 2006, the first year of full operation of the market for NPL, to 2014. We exclude the more recent years because 2015 marked a sharp acceleration of activity in the market for Italian NPL, following the enactment of policy and regulatory measures to accelerate the reduction of NPL of Italian banks.

Under these assumptions, our results suggest that the introduction of the secondary market for brown assets could cut the rebalancing time to about 6 to 7 years, as shown by the dotted lines in figure 1. Assuming, more realistically, that the share of brown assets disposed in the secondary market will gradually increase over time, from 2 per cent to 10 per cent, would imply a slightly longer rebalancing time of 8 years, that is still well below the time required absent the secondary market for brown assets (see figure 2).

Figure 2. Greening banks portfolios: passive vs active rebalancing
(time to balance brown and green exposures)



4. The case for a secondary market for brown assets: a demand-side perspective

This section explores the potential demand for securitized brown assets which, although linked to carbon-intensive assets, do not finance new carbon-intensive projects but, on the contrary, are intended to facilitate the transition to a greener economy by expanding the opportunities for sharing the financial risks of the transition among a broader pool of investors while rising the feasible returns.

From this perspective, securitized brown assets - brown assets backed securities (B-ABS) - can be considered as a hybrid instrument that offers to dedicated green investors, who are committed to sustainable finance, the opportunity to support the transition indirectly on top of financing green projects (direct support).

To assess the current and prospective interest among green-concerned investors, we examine the structure of the market for green bonds.

4a. The Market for Green Bonds

Currently, green bonds are issued by supranational organizations (e.g., European Investment Bank, World Bank), sovereigns, and corporations. Private sector issuers comprise both financial - mainly banks and real estate investment trusts (REITs) - and non-financial corporations (renewable energy, utilities, manufacturing). Green bonds differ from conventional corporate bonds because the issuer commits to use the proceeds to finance or refinance "green" projects, assets, or business activities[8,9]. Issuers typically operate in the energy, transport, and buildings sectors, followed by water, waste, land use, industry, and ICT[10]. However, it is important to note that green bonds typically do not finance new "green" assets but are used for refinancing (Ehlers et al., 2020). Across countries, there is typically no auditing or compulsory verification of green bond use of proceeds.

On the demand side, the growth of green financial markets is largely driven by the increasing number and activity of global ESG funds. Total assets of funds with an ESG mandate exceeded 6 trillion U.S. dollars in 2021 (AFME, 2021). While equity funds constitute the largest portion, fixed income funds are growing fast and account now for 22 per cent of the total. The increasing interest in sustainable investment is confirmed by a survey among issuers, which revealed that 66 per cent of their deals were allocated to investors describing themselves as green or socially responsible[11].

4b. The Greenium

The role of conscious investors has been considered as a possible explanation of the so-called "greenium", i.e., the negative spread observed, particularly at issuance, with respect to the yields of comparable conventional bonds. According to this explanation, green investors are willing to pay a higher price for a bond at issuance, which means they accept a lower yield in exchange for an environmental benefit. This implies that issuers may be able to attract higher demand for their debt by issuing green bonds as opposed to conventional bonds. Alternatively, the greenium may reflect an excess of demand over supply of green bonds, as corporations are slowly adapting to climate change and adopting clean technologies. The empirical literature on the existence and the size of the *greenium* has produced mixed results, reflecting both identification (in the absence of a comprehensive database of ESG bonds) and measuring challenges. Furthermore, the results exhibit a high variability across sectors and individual issuers, reflecting among other factors, their green content and credibility.

[8] In the absence of a regulatory framework, the commitment is not subject to compulsory verification of the use of proceeds for green purposes. This shortcoming can be a source of reputational risk for the issuer, if unable to prove that the proceeds have funded projects with positive and additional impact. Furthermore, the risk that the proceeds are not used for their intended purposes (so-called "greenwashing") can be a major impediment to the development of the green bond market.

[9] According to the International Capital Market Association (ICMA), green bonds are "any type of bond instrument where the proceeds or an equivalent amount 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 Green Bond Principles," with ICMA use of proceeds specifying that "the utilisation of the proceeds of the bond for eligible Green Projects, which should be appropriately described in the legal documentation of the security. All designated eligible Green Projects should provide clear environmental benefits, which will be assessed and, where feasible, quantified by the issuer." Therefore, the only notable difference between green bonds and standard bonds is the commitment made by the issuer on the use of proceeds.

[10] According to data collected by the Climate Bonds Initiative, the first three categories contributed 81% to the total issuance in 2021 (*Sustainable Debt, Global State of the Market*, 2021).

[11] Climate Bonds Initiative, *Green Bond Pricing in the Primary Market H2 2021*.

Some studies, using a matching procedure to estimate the yield differential between a small sample of green bonds and a counterfactual of conventional corporate bonds, have found a negative *greenium,* while others have reached the opposite conclusion but for specific market segments. For instance, Zerbib (2019) finds a small negative premium for the entire sample and more pronounced for financial and low-rated bonds. Similarly, a negative premium is found by Ehlers and Packer (2017), but exclusively for the primary and not for the secondary market, while Larcker and Watts (2020) find identical pricing for green and non-green issues in the US municipal securities market. The results also depend on the observation time frame, with Liberati and Marinelli (2021) finding strong evidence for the existence of the *greenium* and for its increase following the Covid-19 shock. Consistent with this result, Yousaf et al. (2022) find that green bonds are the only asset that served as a safe haven against large stock market fluctuations due to the COVID-19 pandemic; further, using portfolio analysis they show that supplementing conventional stock portfolios with green bonds during the COVID-19 pandemic resulted in the highest risk-adjusted returns, compared to those supplemented with other alternative assets in the sample. Tang and Zhang (2018) find evidence that stock prices and liquidity improve after the issuance of green bonds. Finally, Scatigna et al. (2021) find a positive relationship between the carbon content of business activities and firms' funding costs, with debt from entities with a higher carbon footprint trading at marginally higher yields.

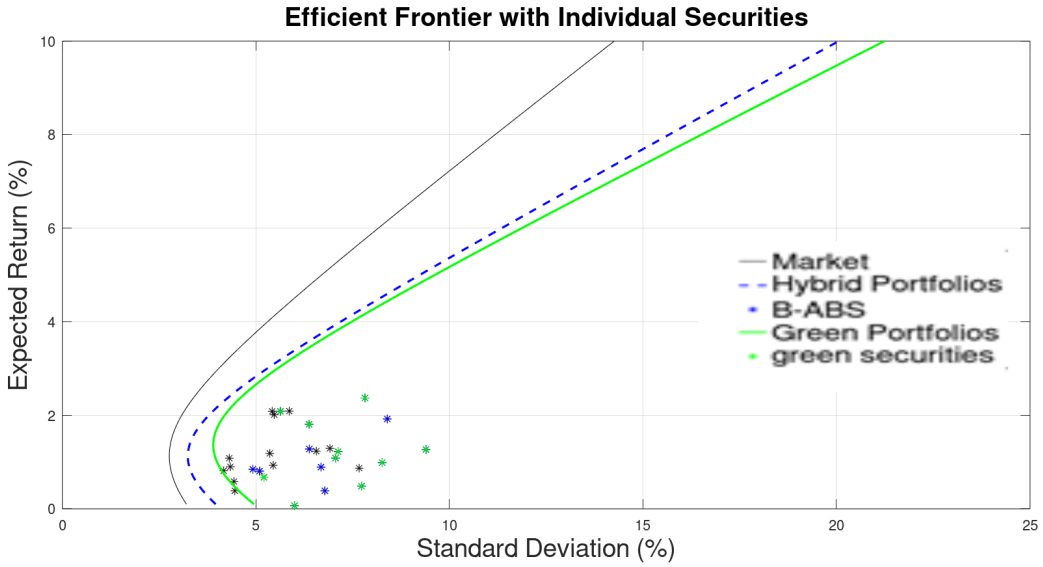
Most market watchers expect demand for green instruments to continue to outstrip supply over the medium term amidst strong investors support, which, in turn, is expected to push more ESG funds to comply with the requirements of the EU Regulation on sustainability-related disclosures in the financial services sector (Regulation (EU) 2019/20881, Sustainable Finance Disclosures Regulation - SFDR)[12].

On the one hand a standard taxonomy and disclosure requirements can support the development of green financial markets by reducing the risk of green washing; on the other hand, it can be argued that as funds' mandates become more binding, delivering satisfactory performance becomes more challenging. In fact, by narrowing the pool of eligible investments, strict sustainable mandates constrain both diversification opportunities and possible returns. As predicted by the portfolio theory, green securities can improve the total expected return of a portfolio for a given level of risk, by holding assets that are not perfectly positively correlated, thereby reducing the idiosyncratic risk associated with the portfolio. However, by restricting the universe of investments exclusively to green assets, a specialized green investment fund will be subject to extra constraints in the construction of the efficient frontier of investments, which, as a result, will offer a Sharpe ratio inferior to that of a less constrained fund. From this perspective, the development of the green asset management industry might reach a hard limit, when the performance gap, in terms of reward to volatility, compared to diversified funds becomes too large to continue to attract investors willing to accept lower risk premiums per volatility for environmental benefits.

To illustrate the opportunity cost of a strict green investment mandate, we first construct a hypothetical efficient frontier of investments representative of the market, using the historical pricing data of all the individual components of the Dow Jones Industrial Average (DJA), and then consider alternative frontiers using subsets of the DJA, as shown in figure 3.

[12] Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector (OJ L 317, 9.12.2019, p. 1).

Figure 3. Introducing brown assets backed securities: potential benefits for investors



The portions of the frontiers that lie above the minimum-variance portfolios represent the best risk-return combinations (optimal portfolios) available to investors. The black frontier, labeled “market”, represents the possible optimal portfolios available to an “unconstrained” investor (diversified fund). Restricting eligible investments to green securities shifts the frontier inward (green line). As a result, a green fund manager will only be able to offer lower expected returns for any accepted level of risk or, conversely, higher risk for any targeted expected return.

By offering additional instruments with different combinations of expected returns and volatilities, the proposed B-ABS (blue stars) may enable green funds managers to shift their efficient frontier outward and, thus, attract additional investors[13]. Graphically, the potential benefits of B-ABS can be illustrated by the intermediate frontier (dotted blue line), that lies between the two solid lines. The dotted blue line has been constructed by adding the B-ABS to the green securities, i.e., using a larger subset of the DJA, thereby shifting the frontier back to the left, although partially. Obviously, this outward shift assumes that green investors will be willing to buy B-ABS. To that end, it will be key to ensure that the potential benefits of a more gradual and smooth transition are fully disclosed and clearly communicated. In the most benign scenario, (brownfield) brown assets will continue to generate a positive stream of returns during the transition until they are fully converted to or replaced by green assets, thereby minimizing the costs of the transition through broader risk sharing and, most importantly, more funding will be available for the green economy.

[13] Notice that B-ABS are intended to increase the set of efficient investments and, thus, are expected to allow for greater risk sharing and reduction rather than to increase systemic risk by leading investors (in our case, banks, and green funds) to hold increasingly similar portfolios (C. Dicembrino and P.L. Scandizzo, 2012).

5. The role for policies

In the previous sections, we have introduced the secondary market for brown assets as a market solution for the management of the financial risks from the transition to the green economy and, hence, for promoting green finance.

Risks management considerations provide incentives to both the supply and the demand sides of the potential new market. Well-defined climate change policies with clear objectives, measures, and timelines, as well as regulatory frameworks for financial risks from climate change would set the best conditions for the actual launch of such a market. Moreover, the correct pricing of the new financial instrument would be critical, suggesting that it will take some time before the market takes off, as banks, specialized purpose vehicles (SPVs), and investors build their valuation models, facilitating the price discovery. In this context, targeted policies can also play a role.

5a. The European Market for NPL

The experience of the European market for NPL is instructive. The securitization of NPL had been around for decades, but the sharp rise of NPL in some European countries in the aftermath of the global financial crisis (GFC) renewed interest in this market. The direct sale and the securitization of NPL, in fact, emerged as the most effective tools to speed up the reduction of NPL in banks' balance sheets and facilitate their resolution. The higher supervisory scrutiny of NPL forced banks to manage these loans more actively, including through securitization.

The activity in the secondary market for NPL increased further following the enactment of targeted policies to facilitate the resolution of NPL and to support their secondary market. For instance, in Italy a first set of measures focused on reforms of debt enforcement and insolvency regimes with the aim of shortening resolution times and improving recovery rates. In addition, the tax treatment of loan losses and write-downs was modified to facilitate the timely recognition of credit losses (Deferred Tax Assets - DTA).

Other measures were introduced to support the securitization market more directly. These included the reform of the main securitization law (D.L. n. 50/2017 amending L. n. 130/1999) and the introduction of a government guarantee scheme for NPL (Garanzia sulla Cartolarizzazione delle Sofferenze - GACs, 2016). This scheme allows for the most senior tranche of the securitized NPL to be guaranteed by the government, contingent on obtaining an investment-grade rating, the sale to private investors of the majority of the junior tranches, and that the guarantee is remunerated at market price. A similar scheme was later introduced in Greece (Hercules Asset Protection Scheme - HAPS, 2019).

Despite the higher costs to the banks compared to non-guaranteed securitizations, government guarantee schemes have made a material contribution to the development of the market for NPL, with the Italian GACS accounting for over half of all NPL exposures securitized in Europe between 2017 and 2021 and the Greek HAPS accounting for another 25 per cent[14].

Similarly, the regulatory treatment of financial instruments can have an important bearing on their success or lack thereof. Under Basel III, a revised framework has been introduced for securitization exposures with special

[14] Boudiaf I. A., Miranda F. G., *An Empirical Study of Securitisations of Non-Performing Loans*, ECB Occasional Paper No. 2022/292, May 2022.

provisions for those resulting from NPL, reflecting their different risk drivers compared to securitizations of performing assets (BCBS, 2020)[15].

In Europe, more recent changes to the regulatory framework for the secondary market for NPL have been introduced through amendments to the EU Securitisation Regulation (EU 2021/557), the Capital Requirement Regulation (EU 2021/558), and the new NPL Secondary Markets Directive (EU 2021/2167), with the view to facilitate sales of NPL, partly in anticipation of the predicted increase in NPL as a result of the impact of the pandemic[16].

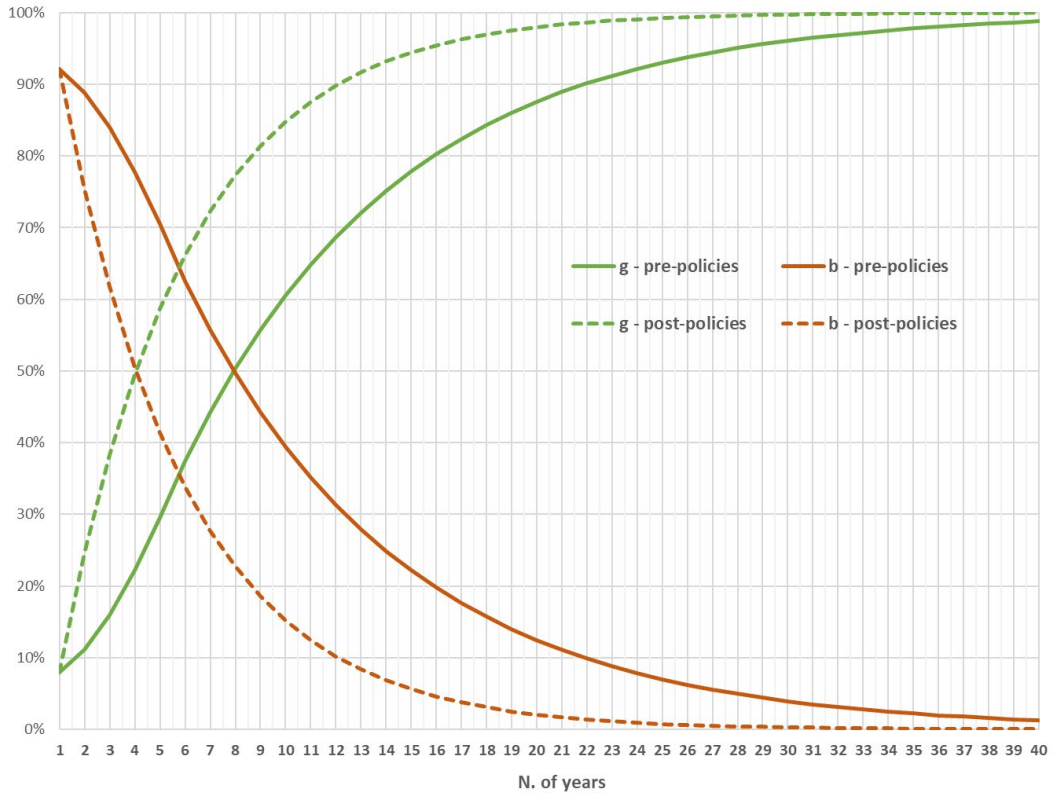
These examples show how targeted policies, including taxes, and regulations can alter – either by strengthening or weaking – the drivers of private market transactions. For instance, similarly to what observed in the case of NPL, banks may incur losses during the offloading period of brown assets, and these losses might be mitigated through ad-hoc tax measures, that shift part of the burden to the public sector. Careful design and calibration of any measure to support the development of the secondary market for brown assets would be needed to ensure consistency with the primary goal to accelerate the transition to a greener economy, while safeguarding public debt sustainability from fiscal risks and climate-related contingent liabilities.

5b. A Policy Simulation

To gauge the potential role for policies, we analyze the developments of the Italian secondary market for NPL in the years since the introduction of the first package of measures to accelerate the reduction of NPL in banks' balance sheets. Under the increased scrutiny of the supervisory authority, banks had already stepped up their efforts to improve their assets quality, including by selling their NPL. In 2014, Italian banks sold 30 per cent of their NPL, up from an average share of 10 per cent over the period since 2006. Nevertheless, the activity in the secondary market for NPL increased much more rapidly in the following years. A series of supportive measures were introduced from mid-2015 to 2017, with a compounding impact on the market, where the share of NPL sold rose to an average of about 50 per cent, registering an increase of 67 per cent from 2014. If we repeat the simulation exercise of section 3 to account for the potential impact of targeted policies, "equivalent" to those used for NPL, the average share of brown assets disposed in the secondary market rises from 10 to 17 per cent, halving the target rebalancing time for greening banks' balance sheets to 4 years (see figure 4).

[15] Basel Committee on Banking Supervision, *Capital treatment of securitization of non-performing loans*, November 2020.
[16] Clifford Chance, *Non-performing loans: the evolving landscape*, March 2022.

Figure 4. Greening banks portfolios: active rebalancing pre- and post-policies
(time to balance brown and green exposures)



These results need be interpreted with caution, as the conditions that led to the adoption of a broad range of measures to facilitate the sale of NPL were very different from those presented here to justify the case for policy action to foster the development of a market for brown assets. In the case of the market for NPL, the policy goal was to bring down the elevated NPL ratios reached after the GFC, and indeed the measures enacted, along with banks' active management of their NPL, proved instrumental in bringing the average NPL ratio to single digit. In the case of green assets, the policy goal would be to raise the greenness of banks exposures from the current low level estimated at just about 8 per cent (i.e., the green asset ratio from the EBA exercise). For this reason, we have conservatively assumed an initial rebalancing goal of 50 per cent of banks assets. Thus, both the starting point and the goal of our simulation exercise are very different from the case of the market for NPL.

However, as the economy transitions to a greener model, banks may consider increasing their green exposures further, pushing forward the rebalancing goal above 50 per cent. Furthermore, the greenness of exposures is quite heterogenous across banks, and those more heavily exposed to brown assets will need more time to rebalance their loan books. These considerations suggest that there is a case for a secondary market for brown assets beyond the extremely short horizon simulated by assuming forceful policy measures like those introduced to facilitate the resolution of NPL.

Finally, it is important to recall that we are assuming that all non-green exposures of banks are brown. This is a significant simplification but ongoing work to improve the environmental taxonomy of activities will allow to refine the analysis using more granular data on the environmental categorization of banks' exposures[17].

Despite all the necessary caveats for drawing conclusions applicable to a hypothetical secondary market for brown assets, the lessons from the experience of the secondary market for NPL show that well-designed policies can play an important supportive role. In principle, this support could be conceived as temporary to reflect the expected life of the potential market for brown assets. In fact, as more economic activities become environmentally sustainable and the whole economy achieves carbon neutrality, the market for brown assets can be expected to vanish. As activity in this market "naturally" declines, support measures will also "automatically" cease to be used, if based on market-pricing, as they will no longer be attractive. Alternatively, support measures may be accompanied by appropriate sunset clauses.

6. Conclusions

The simulations presented in this paper suggest that transferring brown assets from banks' balance sheets to the portfolios of dedicated green investors can help raise private capital to finance the transition to a carbon neutral economy. The proposed market for brown assets (i.e., the B-ABS), on the one hand (supply side) may allow banks to offload part of their brown exposures and, thus, free risk-based capital that could be used to finance new green investments; on the other hand (demand-side), the new market could expand the investment opportunities available to green asset managers beyond the constraints mandated by environmentally conscious investors. As a result, green asset managers may be able to offer superior risk-return profiles and, hence, attract more resources.

The potential benefits of the market for B-ABS stem from greater risk sharing among market participants as well as risk reduction through diversification. Creating a market for brown assets could be possible by leveraging on these supply and demand factors, reinforced by the global efforts to the green economy transition. Nonetheless, the experience of the market for NPL demonstrates that targeted policies can play a decisive role in fostering market development.

[17] The EU taxonomy is currently limited to defining green activities considered as environmentally sustainable from the perspective of the objectives of climate change mitigation and adaptation. However, there is an ongoing work by the platform on sustainable finance, established by the European Commission, to propose a possible approach for defining negative impact economic activities ('brown taxonomy') and no impact activities ('neutral activities'). While this work is in an early stage, it would eventually provide a complete categorization of the full spectrum of economic activities from an environmental perspective.

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