The climate impact of quantitative easing

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November 28, 2017
Outline

1. Background: climate change risk
2. Reaction of central banks supervisory authorities
3. Sectoral impacts of QE
5. Conclusions and next steps
Background: climate change risk

- Physical damages
- Liability
- Transitional
  - Policy changes
  - Technological change
  - Consumer demand
- Potentially affecting the value of:
  - Commodities (oil, gas, coal)
  - Long term infrastructure
  - Firms (extraction, refining, distribution)
  - Sovereigns
  - Investors and wider financial system

Source: BNEF (2016)
Installed capacity (GW): IEA forecast and actual

Source: BNEF (2016)
Responses from central banks and supervisory authorities

- Increasing amount of attention
- Often focusing on:
  - disclosure requirements
  - stress testing

Institutions (partial list)

- G20 (Green Finance Study Group)
- Bank of England
- Banque de France
- Dutch National Bank
- European Systemic Risk Board
- Financial Stability Board
- Banca d’Italia
- Finansinspektionen (Sweden)
- Lebanese Central Bank
- People’s Bank of China
- European Commission (High Level Expert Group on Sustainable Finance)
Why should the ECB consider climate change?

- **Mandate:**
  - According to Article 127 of the Treaty of the Functioning of the European Union (2012): ‘...without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union’
  - which are defined in Article 3 as including: ‘social progress, and a high level of protection and improvement of the quality of the environment’.

- **Financial stability**

- **Academic and practical interest:** what are the effects of monetary policy instruments and implications for macroprudential policy?
## What is the ECB purchasing?

<table>
<thead>
<tr>
<th>Changes of holdings</th>
<th>Asset Backed Securities Purchase Programme (ABSPP)</th>
<th>Covered Bond Purchase Programme 3 (CBPP3)</th>
<th>Corporate Sector Purchase Programme (CSPP)</th>
<th>Public Sector Purchase Programme (PSPP)</th>
<th>Asset Purchase Programme (APP) Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Holdings Sept 2017</strong>*</td>
<td>24,076</td>
<td>231,314</td>
<td>114,658</td>
<td>1,748,063</td>
<td>2,118,111</td>
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<tr>
<td>Monthly net purchases</td>
<td>605</td>
<td>4,686</td>
<td>6,949</td>
<td>50,174</td>
<td>62,414</td>
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<tr>
<td><strong>Holdings Oct 2017</strong>*</td>
<td>24,682</td>
<td>236,000</td>
<td>121,607</td>
<td>1,798,237</td>
<td>2,180,526</td>
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</tbody>
</table>

*Note: At amortised cost, in million euros, at month end. Figures may not add up due to rounding. Figures are preliminary and subject to change.

Source: ECB (2017)
How green are these asset purchases?

• Public sector purchases
  • Depends on government support for low-carbon activities

• Equities
  • Different sectoral distribution from bond market (debt vs. equity financing)

• Asset-backed securities
  • Depends on underlying (E.g., Volkswagen)

• Covered bonds
  • Constrained in issuance
  • Excludes renewable energy loans (Damerow, 2014)

Carbon intensity of (estimated) purchases (ECB)

- Wholesale and retail trade
- Real estate activities
- Financial and insurance activities
- Administrative
- Chemicals and chemical products
- Refined petroleum and coke production
- Transportation and storage
- Information and communication
- Electricity, gas, steam and air conditioning supply
- Manufacturing

Notes: Size of the bubble indicates relative contribution to emissions in euro-area countries. Sources: ECB (ISINs, as of February 2017), Bloomberg (NACE categories, 2017), Eurostat (emissions and GVA data, as of 2013), and authors’ calculations.
Carbon intensity of Euro corporate bond markets

<table>
<thead>
<tr>
<th>1: BICS* sector classification name</th>
<th>2: All Euro corporate bonds (%)</th>
<th>3: All corporate bonds except finance (%)</th>
<th>4: Corporate bonds of eligible maturity (%)</th>
<th>5: Investment grade corporate bonds of eligible maturity (%)</th>
<th>6: CSPP eligible (%)</th>
<th>7: Estimated purchases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications</td>
<td>4.38</td>
<td>13.10</td>
<td>12.81</td>
<td>10.78</td>
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<td>11.11</td>
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<td>Consumer discretionary</td>
<td>5.08</td>
<td>15.20</td>
<td>15.34</td>
<td>12.52</td>
<td>14.37</td>
<td>11.07</td>
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<td>Automobiles manufacturing</td>
<td>2.16</td>
<td>6.47</td>
<td>6.19</td>
<td>7.98</td>
<td>9.85</td>
<td>6.84</td>
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<tr>
<td>Consumer staples</td>
<td>2.35</td>
<td>7.02</td>
<td>7.43</td>
<td>8.43</td>
<td>7.71</td>
<td>8.57</td>
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<tr>
<td>Food &amp; beverage</td>
<td>1.52</td>
<td>4.55</td>
<td>4.94</td>
<td>5.97</td>
<td>7.00</td>
<td>6.97</td>
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<tr>
<td>Energy</td>
<td>2.55</td>
<td>7.64</td>
<td>7.29</td>
<td>8.25</td>
<td>8.63</td>
<td>9.54</td>
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<td>Integrated oils</td>
<td>1.71</td>
<td>5.11</td>
<td>4.68</td>
<td>6.03</td>
<td>7.58</td>
<td>8.40</td>
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<tr>
<td>Renewable energy</td>
<td>0.18</td>
<td>0.55</td>
<td>0.54</td>
<td>0.26</td>
<td>0.02</td>
<td>0.00</td>
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<td>Financials**</td>
<td>70.72</td>
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<td>11.13</td>
<td>12.30</td>
<td>8.64</td>
<td>8.36</td>
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<tr>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>2.62</td>
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<td>Health care</td>
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<td>5.26</td>
<td>5.29</td>
<td>5.98</td>
<td>4.31</td>
<td>4.26</td>
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<tr>
<td>Industrials</td>
<td>3.99</td>
<td>11.93</td>
<td>12.72</td>
<td>11.10</td>
<td>11.16</td>
<td>10.63</td>
</tr>
<tr>
<td>Materials</td>
<td>3.57</td>
<td>10.69</td>
<td>11.16</td>
<td>8.55</td>
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<td>1.96</td>
<td>1.64</td>
<td>1.58</td>
<td>1.78</td>
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<tr>
<td>Utilities</td>
<td>4.97</td>
<td>14.89</td>
<td>14.87</td>
<td>20.45</td>
<td>24.45</td>
<td>24.67</td>
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</tbody>
</table>

Notes: *BICS = Bloomberg Industrial Classification System. **Financial institutions under supervision are excluded from purchase; however, other financial actors such as real estate and financial services are eligible. *** As detailed in Appendix 1, Columns 1–6 are based on a search of ECB-eligible bonds from Bloomberg Terminal, which excludes ‘government’ bonds as ineligible (using BICS sector classification). Column 7 is based on the list of international securities identification numbers (ISINs) provided by the ECB, in which four government-backed entities appear: Deutsche Bahn, SNCF, Sagens and RATP group. Sources: Bloomberg (2017); ECB (2017), authors’ own calculations.
**Carbon intensity of eligible assets (BoE)**

Notes: Size of the bubble indicates relative contribution to emissions in euro-area countries. Sources: BoE (ISINs, as of February 2017), Bloomberg (NACE categories, 2017), Eurostat (emissions and GVA data, as of 2013), and authors’ calculations. *Manufacturing excludes manufacture of petroleum.*
# Carbon intensity of UK corporate bond markets

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<thead>
<tr>
<th>1: BICS* sector classification name</th>
<th>2: All sterling corporate bonds (%)</th>
<th>3: All corporate bonds except finance (%)</th>
<th>4: All corporate bonds of eligible maturity (%)</th>
<th>5: Investment grade corporate bonds of eligible maturity (%)</th>
<th>5: CBPP eligible (%)</th>
<th>7: Bank of England benchmark list of eligible bonds (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications</td>
<td>8.64</td>
<td>14.29</td>
<td>13.15</td>
<td>12.48</td>
<td>12.89</td>
<td>12.23</td>
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<tr>
<td>Consumer discretionary</td>
<td>11.31</td>
<td>18.71</td>
<td>18.49</td>
<td>13.10</td>
<td>13.32</td>
<td>10.83</td>
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<tr>
<td>Automobiles manufacturing</td>
<td>2.55</td>
<td>4.22</td>
<td>3.44</td>
<td>3.37</td>
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<td>Consumer staples</td>
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<td>7.98</td>
<td>8.09</td>
<td>10.50</td>
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<tr>
<td>Food &amp; beverage</td>
<td>1.67</td>
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<td>46.89</td>
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<td>12.55</td>
<td>11.13</td>
<td>11.06</td>
<td>6.60</td>
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<td>Government***</td>
<td>0.00</td>
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<td>0.00</td>
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<td>2.80</td>
</tr>
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<td>1.26</td>
<td>2.08</td>
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<td>2.31</td>
<td>2.40</td>
<td>1.20</td>
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<tr>
<td>Technology</td>
<td>0.51</td>
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Carbon intensity of purchases: main points

• Manufacturing and electricity production:
  • Estimated 62.1% of purchases, 58.5% of Eurozone area emissions, but only 18% of GVA.

• Chemical and petroleum products:
  • also emissions-intensive (especially when considering emission accounting)
  • contribute less than 1% of Eurozone GVA

• Wholesale and retail trade, real estate:
  • Relatively small percentage of purchases, though they contribute a relatively large amount to GVA and relatively little to emissions.

• Reflects the bond market (high capital intensity of manufacturing and utilities, use of debt financing) and eligibility criteria
Theoretical implications of choice of purchased asset

- Academic literature suggests frictions in transmission mechanism:
  - Impact of QE is easiest to demonstrate on asset being purchased, with impact on other assets is more difficult to separate from other influences (Joyce et al., 2010).
  - Assets with a similar risk profile benefit relatively more than higher-risk bonds (Krishnamurthy and Vissing-Jorgensen, 2011, 2012; Rogers, 2014).
  - In the UK, micro-analysis of institutional investors shows that the purchase of Gilts resulted in some portfolio rebalancing effects towards corporate bonds, but not equities (Joyce et al., 2015).
- Which suggests differential effects between purchased and unpurchased assets (Rogers 2014)
Effects of corporate bond purchases

- Additional debt issuance and lower borrowing costs (Buell, 2016; Yap, 2016).
- Widening yield spreads between:
  - purchased and unpurchased assets
  - eligible and ineligible bonds (Keohane, 2016)

Source: Keohane (2016)
Energy sector: oil and gas

- ECB: Apetra, ENI, OMV, Petrol, Shell, Repsol, Sagess, Schlumberger, Total, Transport ET and Vier Gas
- Debt financing used for investment in long-term infrastructure, potentially contributing to carbon lock-in (Unruh, 2000).
- Oil and gas sector is already heavily indebted, with concerns about credit default (particularly for emerging markets and smaller American producers) (Blas, 2016; Crooks, 2016; Loder et al., 2016; Domanski et al. 2015)

Source: Bakewell, 2016
Energy sector: renewables

- No renewable energy bonds purchased (according to Bloomberg classification)

- Why?
  - Different financing structure (equity and loans)
  - Investment grade status
  - Other barriers to eligibility, e.g. as ABS?

- Importance of understanding funding channels: corporates, investment funds, development banks, project bonds, etc.

Source: OECD, 2016
Next steps: research, disclosure, collaboration

- Research
  - How central bank operations are affected by, but also could affect, transition risk
  - Working with relevant supervisory authorities on scenario analysis and stress testing
- Disclosure
  - Selection process, amounts purchased, and underlying assets (covered bonds and ABS)
  - Supporting the work of the FSB’s Task Force on Climate-Related Financial Disclosure
- Collaboration
  - Working with other relevant authorities such as EIB to address e.g. barriers to eligibility
  - Supporting the European Commission’s High Level Expert Group in Sustainable Finance
Possible future policy options

• Though QE will begin tapering in 2018, ECB announced it will keep reinvesting proceeds of maturing bonds

• Revise risk criteria in purchasing decisions
  • Possible discrepancies in how credit ratings agencies assess climate risk

• Revise purchasing strategy
  • ‘Green’ bond market is small but expected to increase
  • Constraints in purchasing bonds from development banks

• Adjusting macro-prudential policy
Conclusions

- Analysis suggests corporate bond purchases skew towards manufacturing and utilities
  - Largely reflects the Euro-area corporate bond market and eligibility criteria for the program
  - Inadvertently supports the status quo and favours industry incumbents
- Purchases of carbon-intensive bonds encourages additional debt issuance
  - Investment in long-term infrastructure
  - Possible stranded assets
  - Possible mispricing risk – ‘carbon bubble’
- Highlights importance of high-level policy coordination and identification of institutional barriers to scaling up green finance
Thank you!

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Background information
QE: stylized transmission mechanism

- Asset purchases used as unconventional monetary policy instrument
- Targeting broad-based growth
- Aiming for neutrality in the sense of avoiding market distortions

Source: Authors, based on Benford (2009)
Are climate risks priced into financial assets?

- Ongoing topic of research
- Efficient market hypothesis (Fama, 1970) suggests risks should be priced in, but:
  - investors may not find future climate policy credible, or underestimate the speed of technological change
  - may lack sufficient information to make the assessment (TCFD, 2016)
  - cognitive biases (Schiller, 2000; Kahnemann, 1975)
  - or face other institutional and normative barriers related to time horizons (Carney, 2015)
- Also depends on future of technological development (e.g. CCS) and renewable deployment
- Extent of mispricing is unknown, but could be significant
Equity holdings in EU and US listed companies in 2015

Source: Battiston et al. (2017)
Potential losses to European banks

Source: Battiston et al. (2017)
Targeted use of monetary policy instruments

- **Federal Reserve**: purchases of mortgage-backed securities in its first round of QE from 2008 to 2010
  - Cleaned up banks' balance sheets from underperforming and illiquid assets
  - Freed them to extend more credit to the larger economy and helped to lower mortgage rates (Khemraj and Yu, 2016; Krishnamurthy and Vissing-Jorgensen, 2011; Ryan-Collins, 2013).
  - Analysis suggests a wider macroeconomic impact than the second round of QE in 2011, which focused on Treasury bonds only (Krishnamurthy and Vissing-Jorgensen, 2011).

- **ECB**: Long-term refinancing operations to encourage lending to real economy

- **Bank of England**'s Funding for Lending Scheme has targeted household lending (until November 2013) and lending to SMEs

- **Bank of Canada**: Purchased bonds issued by the Canadian Industrial Development Bank to support loans to SMEs (Ryan-Collins (2013)).