

Technical annex: The cash-flow deficit of UK companies in a Covid-19 scenario¹

The ‘UK corporate sector financing and Covid-19’ chapter of the May 2020 interim Financial Stability Report draws heavily on analysis conducted by Bank staff to estimate how the Covid-19 shock might affect UK corporate finances this year. This technical annex provides detailed explanations of the data and assumptions used to produce the quantitative analysis that appears in the chapter. Given the unprecedented nature of the stress and the scale of the policy response, estimating the impact of the Covid-19 shock on the UK corporate sector carries a high degree of uncertainty.

1 Rationale for the exercise

UK companies will require additional financing to weather the Covid-19 shock

Economic activity in the UK has fallen sharply in recent weeks. Public health interventions introduced to tackle the spread of Covid-19 have directly reduced production and demand, depressing turnover for many UK companies.² Even if the shock proves to be temporary and turnover recovers fully, the short-term reduction in cash flow could mean that some companies are unable to pay their workers and maintain their productive capacity without taking on new external financing. This exercise provides indicative estimates of how large this ‘cash-flow deficit’ could be under an illustrative Covid-19 scenario, and discusses how UK companies might seek to fill it.

An aggregate calculation would imply that UK companies have a very small cash-flow deficit

The UK corporate sector as a whole had relatively strong profitability and liquidity positions before the Covid-19 shock. But this masks important differences across sectors and individual companies. This heterogeneity will have a direct influence on how the shock plays out in practice.

In the latest National Accounts for 2019, UK companies were estimated to have total annual profits of just under £400 billion, which compares to total market output (comparable to turnover) of around £2.3 trillion. This profit margin alone is large enough to absorb a 16% fall in output with the corporate sector still able to pay its labour costs in full. On top of this, companies have a total of £750 billion of cash and equivalents on their balance sheets³ and access to a further £260 billion of undrawn credit facilities that have been committed by banks.⁴ Together these sources of liquidity could absorb a further 42% fall in output. Undrawn credit facilities and cash combined would be roughly sufficient to pay labour costs in full for an entire year even if turnover fell to zero.

However, aggregate calculations like these are misleading. Profits and cash flows vary substantially across sectors and individual companies, and many companies have little existing cash or undrawn credit facilities to draw on. Therefore, even if the UK corporate sector as a whole has the resources required to weather the shock, financial intermediation will likely be required to make sure individual companies have sufficient liquidity to bridge

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(2) Throughout this document, ‘companies’ refers to private non-financial companies and ‘corporate sector’ refers to all private non-financial companies on aggregate.

(3) As recorded in the ONS national balance sheet estimates, which reports total currency and deposits held by UK private non-financial companies. <https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/data/sets/thenationalbalancesheetestimates>.

(4) This is based on the Bank of England data on undrawn facilities by UK monetary financial institutions to UK non-financial corporates in Bankstats Table C1.2. <https://www.bankofengland.co.uk/statistics/tables>.

temporary cash-flow deficits. Companies that have small liquidity buffers, high fixed outgoings and/or face a large reduction in turnover will be most vulnerable.

Bank staff have modelled how the shock affects company finances at the individual company level

We have conducted an accounting exercise to model how the Covid-19 shock might affect the cash flows of individual companies and the cash-flow deficit that this might imply. The 'cash-flow deficit' is a mechanical estimate of the financing that might be required by UK companies to minimise the extent to which they need to change their spending, which could include making staff redundant or underinvesting in productive capital.

Throughout this exercise, we condition on an assumption that companies seek to maintain their productive capacity at pre-shock levels, as defined by the latest company accounting data that companies have reported. Maintenance of productive capacity is assumed to include retaining staff, avoiding wage cuts, keeping hours constant and maintaining the capital stock, including property and equipment. This mechanical exercise is designed to provide an indication of the amount of financing the corporate sector could require to mitigate the risk that the economic disruption causes long-term economic damage.

2 The data set

We have constructed a data set covering around 85,000 UK companies

We have compiled accounting information on individual UK companies from Companies House and listed company filings. For the purpose of this analysis we define UK companies as those that are either incorporated in the UK or incorporated in the Crown dependencies and headquartered in the UK. We use the latest available financial information, which for most companies is for the 2018-19 financial year.¹ The sample consists of around 85,000 companies, covering over £4trn in total turnover.² The missing companies in the data set are typically either smaller SMEs with less than £10m in turnover or sole-traders.

We combine information on listed and privately-owned companies

We have combined listed company filings accessed via S&P Capital IQ with Companies House filings accessed via Fame (Bureau van Dijk) to ensure that our data captures all UK companies that provide detailed public accounting information at the highest quality available. Listed companies provide more granular information on their finances but only account for a relatively small portion of economic activity among UK companies overall. We estimate that listed companies have total turnover of around £1.7 trillion, which compares to £4.1 trillion for the population of UK enterprises according to our estimates (see **Table 3**).

We augment the information we have on listed companies using information on the UK companies that file accounts at Companies House, which includes a large number of privately-owned companies.³ We match the two data sets together using Companies House registration numbers. For S&P Capital IQ we use LEIs, ISINs and company names to match to registration numbers. **Table 1** describes the key variables that we use in our analysis.

We have consolidated the company accounting data at group level

To avoid double counting, we consolidated data on a much larger number of companies to arrive at our final sample of 85,000. This 'cleaning' process involved a number of steps.

First, we downloaded company identifiers from Fame (Bureau van Dijk) to include all active, non-financial companies with recently filed turnover data – a total of 216,000 companies.⁴ This information allowed us to identify familial corporate entities – those that belong to common groups – and whether they report consolidated accounts.

(1) For most companies these were the latest available accounts as at 21 April 2020. Approximately 38% of the sample by turnover is based on 2019-20 company accounts. These tend to be larger and listed companies.

(2) For the purpose of this analysis, we use turnover, annual sales and revenues interchangeably to mean the same thing.

(3) All limited companies in the UK are required to report to Companies House.

(4) Companies are included if they meet the following criteria: have a trading or registered office address in the UK; are active; have BvD independence indicator A to D or are publicly listed or companies for which all shareholders or all shareholders with a stake greater than 25% are individuals or employees; have a known turnover value in their accounts reported between 2017 and 2020; are not companies with financial SIC codes and are not German companies with UK registration.

Second, we removed entities that are consolidated into a group. For each entity we followed their ‘family tree’ to identify the highest UK-domiciled company in each branch that reports consolidated accounts. We kept only those entities. In many cases, those entities are the parent company of a group (including UK parents of foreign-owned companies).

Table 1 The data set combines information on public and private companies covering profit and loss account, cash flow statement and balance sheet items

Key variables used in our analysis^(a)

Variable	S&P Capital IQ	Companies House (via Bureau van Dijk)
Turnover	Income from operating activities.	
Labour costs	Wages and salaries, social security costs, pension costs and other labour costs.	
Non-labour, non-rental costs	Operating expenses that are not labour costs or property rental expenses. Calculated as the difference between turnover and EBITDA minus rental expenses.	
Property rental expenses	Operating lease and rental payments on land and buildings.	
EBITDA	Earnings before interest, tax, depreciation and amortisation.	
Depreciation	Depreciation on tangible assets. Does not include impairments on tangible assets.	
Interest paid	Interest paid and interest capitalised.	Interest paid.
Capital expenditure	Capital expenditures as reported in cash flow statement.	Calculated as the difference between this year and previous year's tangible assets, plus depreciation and impairment.
Dividends	Dividends paid to shareholders.	
Share buybacks	Repurchase of common stock.	Not available.
Cash and cash equivalents	Cash at hand and in bank and short-term investments.	
Undrawn revolving credit facilities and overdrafts ^(a)	Undrawn revolving credit facilities.	Not available.
Inventory	Inventory of finished goods, work in progress and raw materials.	
Accounts receivable	Claims for payment on goods supplied and services rendered.	
Tangible assets	Value of property, plant and equipment net of depreciation.	
Accounts payable	Amounts due to vendors and suppliers.	
Total debt	Current and non-current debt liabilities.	

Sources: S&P Capital IQ; Fame (Bureau van Dijk); Bank of England; regulatory data; Bank calculations.

(a) Listed company disclosures on undrawn revolving credit facilities have been supplemented with regulatory data on individual company undrawn balances.

Third, we consolidated entities that are not consolidated under the parent entity. There are entities within some groups that are consolidated, but not under the parent. In such cases, we kept the highest consolidated entities within each ‘branch’ or all unconsolidated entities within each ‘branch’. UK subsidiaries of foreign companies often conform to this type of corporate structure. After removing all entities that are consolidated within other UK companies’ accounts (steps two and three), the data set contained around 180,000 companies.

Fourth, we downloaded financial accounts data for those 180,000 companies, keeping only companies for which we had recent information on turnover and earnings before interest, tax, depreciation and amortisation (EBITDA) in the same year. This reduced the sample to around 100,000 companies.

Finally, we consolidated these companies into groups, which gave us a final sample of 84,174 companies, comprising both individual companies and corporate groups. We did this by summing the company financials of the remaining entities within each corporate group to form one entity. This final consolidation step embodies an

assumption that most corporate groups behave as if they were one entity, where financial resources are fungible across the group. Foreign-owned companies were consolidated at a UK group level. We are therefore assuming that they are operationally and financially separate from their foreign owners.

Table 2 contains some basic statistics summarising the key variables in the data set we have compiled.

Table 2 The data set covers a wide range of companies and variables

Summary statistics for key variables used in the modelling^(a)

£ thousands	25 th percentile	Median	75 th percentile	90 th percentile
Turnover	29	139	8,358	32,709
<i>Per cent of turnover</i>				
Labour costs	14.6	27.1	42.3	64.1
Property rental expenses	0.6	1.3	2.5	5.7
Non-labour, non-rental costs	31.3	54.0	74.1	89.9
EBITDA	0.8	8.6	29.2	64.8
Interest paid	0.0	0.0	0.1	1.5
Depreciation	0.0	0.5	2.4	7.3
Capital expenditures	0.0	0.0	0.9	4.7
Dividends and buybacks	0.0	0.0	0.0	4.9
Cash and cash equivalents	0.0	2.5	17.2	63.3
Inventory	0.0	0.0	1.0	13.4
Accounts receivable	0.0	0.0	10.3	20.4
Accounts payable	0.0	0.0	5.3	12.5

Sources: S&P Capital IQ; Fame (Bureau van Dijk); Bank of England; regulatory data; Bank calculations.

(a) Some variables are reported as missing in our data and have been imputed from sector medians. This relates to labour costs and to property rental expenses. For other variables with missing values we have assumed these are zero values for companies. This relates in particular to the variables on interest paid, dividends, buybacks and undrawn facilities. As an example for interest paid, the relevant statistics would be the following if missing values were omitted: 25th percentile: 0.1%, median: 0.5%, 75th percentile: 2.2%, 90th percentile: 12.3%.

The data set has good coverage of companies with annual turnover of greater than £10 million

Comparing our sample to the wider population of UK companies reported in the ONS Business Structure Database suggests that we have a large sample of companies with greater than £45 million in annual turnover and a reasonably large sample of companies with turnover between £10 million and £45 million (**Table 3**).

The total turnover in our sample suggests that we likely capture a large proportion of UK companies with a turnover greater than £10 million. However, our data set does also include the non-UK turnover of some multinational companies. As a result, turnover of the largest companies in our sample exceeds the estimates of UK turnover for those companies in the ONS database.¹

The companies in our sample have total cash and equivalents on their balance sheets of around £500 billion, which compares to £750 billion for the UK corporate sector as a whole. We have data on individual undrawn credit facilities totalling £180 billion, which compares to a total of £260 billion committed by UK monetary financial institutions to the UK corporate sector overall. This £80 billion gap is likely explained by a lack of reporting in the company level data.²

(1) While the data set does include data on the UK sales of many of these companies, this is not the most appropriate definition of turnover for this exercise. That is because it excludes turnover generated through exports. Given the exercise, it is also not obvious that excluding turnover on overseas operations is desirable. Many multinational companies with limited UK operations but with UK headquarters access finance through the UK financial system.

(2) Undrawn credit facilities are not a standard item reported in company accounts.

We have low coverage of SMEs, mostly because few file detailed public accounts

Companies House filings do not allow us to obtain information on all companies in the UK. Sole proprietorships and partnerships do not have to report to Companies House. And the reporting criteria for Companies House differ by company size, with less onerous reporting requirements for small companies and micro-entities.¹

Typically, small companies only file very basic profit and loss accounts (if they provide any at all) and simple balance sheet information. This information is not sufficient to estimate the impact of the Covid-19 shock on their finances. Our coverage of small companies with turnover of less than £10 million is, therefore, very limited and so our estimates effectively exclude any cash-flow deficit that these small companies might have. The impact of Covid-19 on these companies is discussed qualitatively in the May 2020 Interim Financial Stability Report (hereafter 'FSR').

Table 3 The data set mostly covers companies with greater than £10 million in turnover

Turnover of companies in our sample and in the Business Structure Database (BSD) ^{(a) (b)}

Turnover bracket	Turnover in the sample (£ million)	Turnover in BSD (£ million)	Ratio of the sample to UK enterprise population
≤ £10 million	56,511	944,400	6%
£10-45 million	274,642	417,800	66%
£45-250 million	480,957	590,600	81%
£250-500 million	243,543	282,900	86%
> £500 million	3,039,749	1,893,000	161%

Sources: ONS; S&P Capital IQ; Fame (Bureau van Dijk); Bank of England; Bank calculations.

(a) The BSD data is at enterprise level and does not include non-registered sole traders. These are covered in more detail in a box in the FSR.

(b) This was produced using statistical data from ONS. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research data sets which may not exactly reproduce National Statistics aggregates.

We crudely split the data into quarters

The majority of UK companies only file annual accounts and our sample only contains annual data. But the illustrative Covid-19 scenario described below incorporates significant quarterly variation in turnover. There is a much larger decline in turnover in 2020 Q2 while mandatory social distancing measures are in place, followed by a gradual recovery over the remainder of the year as the measures are gradually relaxed. To attempt to capture those dynamics, we divide the annual financial flows data by four to estimate quarterly flows.²

We impute missing data in some places

In some cases the company accounting data contains missing values for variables that are important in our modelling. We impute missing values by assuming that companies have similar characteristics to the median company in their sector (UK SIC 2 digit). We apply this method to fill in missing data on labour costs and property rental costs.³ Specifically, we assume that companies with missing values for these variables have the same ratio of each cost to overall operating costs (turnover minus EBITDA) as the median company in each company's sector.

3 An illustrative Covid-19 scenario for the turnover of UK companies

The turnover shocks we model are illustrative and are designed to be roughly consistent with the sharp fall and the subsequent recovery in GDP in the illustrative scenario in the Monetary Policy Report

We model turnover shocks for UK companies at a sector level in a scenario that is designed to be roughly consistent with the illustrative scenario described in the May 2020 Monetary Policy Report (hereafter 'MPR'). In that illustrative scenario, UK GDP falls sharply in 2020 H1, before recovering relatively rapidly in 2020 Q3 and rising further in 2020 Q4. GDP remains below pre-shock levels throughout the first year of the scenario.

Underlying the illustrative scenario is an assumption that enforced social distancing measures remain in place until early June. They are then lifted, gradually, over the following four months, until the end of Q3. The fiscal support

(1) Micro-entities (small companies) can opt to file only micro-entity (abridged) accounts if they fulfil at least two of the following criteria: a turnover of £632,000 (£10.2 million) or less; £316,000 (£5.1 million) or less in assets on balance sheet; 10 (50) employees or less.

(2) This should not be interpreted as capturing any potential seasonality in companies' operations, which would, in any case, presumably differ somewhat from usual in current circumstances.

(3) Approximately 9% of companies in our sample report property rental costs.

measures announced by the Government are assumed to remain in place, and to be unwound, over the same period. These assumptions should not be taken to imply that they are or should be Government policy. See Section 1 of the MPR for more details.

The shock to turnover is likely to vary significantly across sectors

The Covid-19 shock is likely to have very different consequences for companies depending on the sector in which they operate and the revenue streams that they collect. Some companies will be directly affected by social distancing and will face large declines in turnover, especially in 2020 Q2. Other companies may find their turnover reduced through a decline in spending on non-essential goods and services. Others will be affected indirectly by falls in intermediate demand through the supply chain, or by reduced demand from abroad. A smaller number of companies may even see their turnover increase as spending habits change in response to the shock.

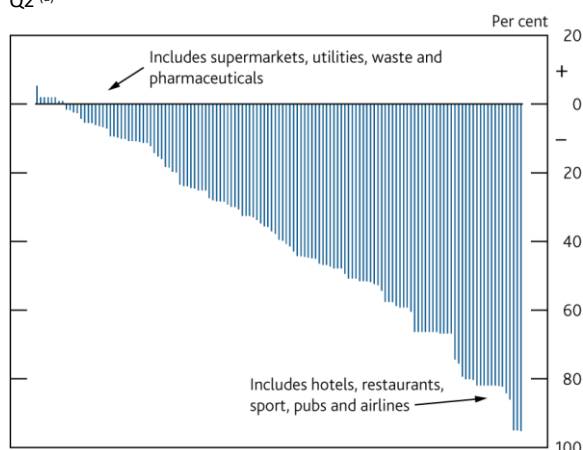
Bank staff have estimated how the illustrative scenario might play out across sectors of the economy. This involved making a set of detailed assumptions about how final demand in each sector of the economy might be affected by the shock over time. These assumptions were informed by real-time spending indicators, as discussed below, and were designed to be broadly consistent with the illustrative MPR scenario.¹ In each time period, we multiply the vector of changes in final demand by sector with the ‘Leontief inverse’ matrix which takes into account the supply chain linkages between different sectors. The result is an estimate of the impact on output for each sector in the economy, after taking into account those supply chain linkages.

In general, we do not explicitly consider any changes in prices in the analysis. The only exception to this is for companies involved in the extraction of oil and gas, where we have assumed that output prices fall in line with the large falls in energy prices in recent months. Our scenario implies significant differences in the size of the turnover shocks across sectors, as shown in **Chart 1**.

We model extremely large turnover falls in 2020 Q2 for companies in the hospitality sector, sports companies and airlines. We model much smaller turnover falls, or even slight increases, for supermarkets and utilities. We also model differences in the persistence of the turnover shock for different sectors, with slower recoveries for sectors that are likely to be more affected by continued caution after formal social distancing measures have been withdrawn. **Chart 2** shows what these sector-by-sector assumptions imply for aggregate turnover in the four quarters of our illustrative scenario.

Chart 1 The 2020 Q2 shock to turnover varies by sector

Average turnover shock applied by sector and sub-sector in 2020 Q2 ^(a)

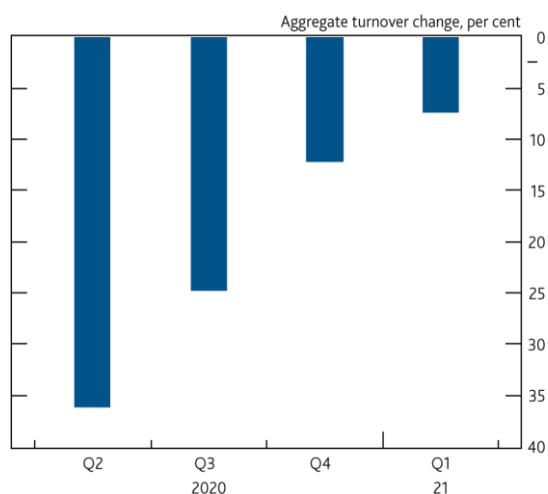


Source: ONS; S&P Capital IQ; Fame (Bureau van Dijk); Bank of England; Bank calculations.

(a) The chart shows the change in turnover estimated by Bank staff in the illustrative scenario compared to turnover before the Covid-19 shock.

Chart 2 The shock gradually eases off after 2020 Q2

Aggregate turnover shock applied from 2020 Q2 to 2021 Q1 ^(a)



Source: ONS; S&P Capital IQ; Fame (Bureau van Dijk); Bank of England; Bank calculations.

(a) The chart shows the modelled change in aggregate turnover for all companies in the sample compared to turnover before the Covid-19 shock.

(1) To give an example, in general we assume a larger reduction in spending on sectors relating to ‘social’ consumption expenditure such as restaurants and hotels.

We have cross-checked our turnover assumptions against real-time spending data

We have compared our turnover estimates to high-frequency sources of information about how turnover is evolving through the shock to date. This includes real-time payments data that measures spending volumes on credit and debit cards, which has already shown steep falls in spending for sectors like airlines, and a wide range of other indicators of economic activity (see Section 2 of the MPR). Evidence from the Bank's April Decision Maker Panel (DMP) survey suggests that the sectoral shocks we model broadly align with respondents' expected sales.

Despite these cross-checks, our estimates of turnover shocks over the next year should be treated as highly uncertain. In part, that reflects the large degree of uncertainty surrounding the outlook for the aggregate economy, as described in the MPR. The mapping from aggregate spending to final demand for individual sectors is another source of significant uncertainty, requiring a large number of detailed assumptions. Lastly, mapping these effects through the ONS input-output analytical tables introduces additional uncertainty.¹

Finally, note that we use the input-output tables to allocate the pre-specified hit to final demand across sectors. We do not attempt to model amplification effects resulting from disruption to supply chains.

4 The mechanical accounting calculation

We estimate the cash-flow deficit that the turnover shock creates for each company, under the assumption that companies maintain their productive capacity through the shock

We produce a proxy estimate of 'free cash flow', which reflects the net cash flow that companies have available after they have covered all of their operating costs (including labour costs and rental expenses), interest, tax, capital expenditure, changes in working capital and shareholder payouts. We refer to a company as having a cash-flow deficit if their free cash flow is negative. We refer to the sum of deficits across all companies that are in deficit as the aggregate cash-flow deficit. This should be interpreted as a measure of the liquidity that companies will require to maintain productive capacity.

We use our company accounting data to estimate how the shock to turnover might affect companies' profits and cash flows in the coming quarters, under the assumption that companies maintain productive capacity at pre-Covid-19 levels. This depends on a range of more detailed assumptions about how company finances change in response to the shock. The assumptions used, including the estimates of the sector-level turnover shocks, are more likely to hold on average than for any individual company.

We start with a calculation that does not take into account announced fiscal policy measures that have been announced to support businesses ('Step 1'). We then repeat the calculation with some simple, mechanical rules designed to capture loosely the effects of the announced fiscal policy measures ('Step 2'). **Table 4** and the rest of this section set out our assumptions. **Box 1** walks through how the calculations work for an example company.

Step 1: Estimating the implied cash-flow deficit without the fiscal policy response

We first estimate the cash-flow deficit before any of the business support policy measures

The following formula sets out how we estimate the company-level cash-flow deficit from the accounting data before taking into account fiscal policy. The subscript *i* denotes an individual company, *t* is a quarter and *t=0* is the period before the shock. We produce this calculation for 2020 Q2 to 2021 Q1, to capture the next full year.

$$\begin{aligned}
 \text{Cash flow deficit before policy}_{it} &= -[\text{turnover}_{i,0} \times (1 + \text{shock}_{it}) - \text{labour costs}_{i,0} - \text{rental expenses}_{i,0} \\
 &\quad - \text{other operating costs}_{i,0} \times (1 + \text{shock}_{it}) - \text{interest expenses}_{it} - \text{corporation tax}_{it} \\
 &\quad + \text{change in working capital}_{it} - \text{maintenance capital expenditure}_{i,0} \\
 &\quad - (\text{dividends}_{it} + \text{buybacks}_{it})]
 \end{aligned}$$

(1) While the input-output analytical tables are a powerful tool for economic analysis, their use involves a number of simplifying assumptions, including the omission of dynamics and substitution effects as demand for intermediate inputs adjusts to the hit to final demand and changes in relative prices. See here for the latest tables. [https://www.ons.gov.uk/economy/nationalaccounts/supplyandusetables/data sets/ukinputoutputanalyticaltables%20detailed](https://www.ons.gov.uk/economy/nationalaccounts/supplyandusetables/data%20sets/ukinputoutputanalyticaltables%20detailed).

Table 4 The calculation we apply estimates a post-shock cash-flow deficit at individual company level

Assumptions for modelling the implications of the shock for company finances

Estimated cash-flow deficit at individual company level

Turnover	Modelled by Bank staff to be broadly consistent with the illustrative May 2020 MPR illustrative scenario, with different profiles across sectors and, in some cases, sub-sectors.
<i>minus</i> Operating costs, of which:	
Labour costs	Assume that companies maintain employment, hours and compensation at pre-shock levels absent furloughing – see Coronavirus Job Retention Scheme (CJRS) row below.
Property rental costs	Companies continue to pay 100% of property rental costs.
Other operating costs	Change in line with turnover, consistent with proportional decline in the use of intermediate inputs (and value-add falling in line with output).
<i>minus</i> Other cash flow impacts, of which:	
Interest	Assume companies pay interest on their outstanding debt, taking into account the cuts to Bank Rate during 2020.
Corporation tax	Assume no change in corporation tax rate.
<i>plus / minus</i> Change in working capital	Trade creditors and trade debtors change in proportion to turnover. Inventories unchanged.
Capital expenditure	Cut to a maintenance level equal to depreciation.
Dividends / buybacks	Cut to zero unless company has positive cash flow.
equals Cash-flow deficit before fiscal policy response	
<i>plus</i> Coronavirus Job Retention Scheme (CJRS)	Estimate number of furloughed workers proportional to 75% of the fall in turnover over the period of the shock. 25% of the fall in output is explained by a fall in turnover per employee. Assume companies do not pay the remainder of labour costs of furloughed workers.
<i>plus</i> Business rates relief and cash grants for certain sectors	Estimate 'rateable value' – the commercial rents measure to which business rates apply – for companies in eligible sectors to estimate eligibility.
<i>plus / minus</i> VAT deferral	Estimate current VAT receipts and payments. Assume lag between cash inflow and cash outflow when company pays HMRC.
equals Cash-flow deficit after fiscal policy response	

Sources: Bank of England

Companies might opt to fill this deficit in a number of ways. Among other things, they could make use of the Government policy measures that have been put in place to directly support business cash flows and employment, such as the Coronavirus Job Retention Scheme (hereafter 'CJRS'). They could also respond by drawing on existing credit facilities, depleting their cash balances, borrowing from banks or non-banks, raising equity or selling illiquid assets. We discuss these options in more detail in Section 9.

We aggregate the cash-flow deficit across all companies in our sample to produce an estimate for the UK corporate sector

We aggregate the estimated cash-flow deficit across all companies in our sample to produce an estimate of the aggregate cash-flow deficit for the UK corporate sector. When we produce the aggregate estimate we do not net off the positive cash flows of companies that do not have a deficit. The aggregate cash-flow deficit is the sum of all the deficits across the companies that have one.

$$\text{Aggregate cash flow deficit before policy}_t = \sum_{i=1}^{N=84,174} \left(\text{Cash flow deficit before policy}_{it} \mid \text{Cash flow deficit before policy}_{it} > 0 \right)$$

This is an estimate of the total cash-flow deficit this year, not the marginal impact of the shock

In a normal year, even without sharp falls in turnover, many companies will naturally have negative cash flows. This might reflect standard fluctuations in their turnover, costs or investment plans over time and that some companies struggle even in normal times.

In the latest accounting data we estimate an annual ‘normal times’ pre-distribution cash-flow deficit of £78 billion in the absence of the Covid-19 shock. In producing that estimate, we assume that capital expenditure is unchanged compared to the latest value reported in the accounting data, which, for many companies, exceeds a maintenance level. Any cash-flow deficit that arises over and above this can be interpreted as the marginal impact of the shock.

The turnover shocks affect companies according to the sector in which they operate

We apply the sector-specific shock profiles to individual companies’ turnover in order to model the quarterly profile of their turnover for the duration of the shock. For this, we take the average quarterly turnover obtained from individual companies’ latest annual reports and shock these each quarter according to each sector’s specific profile.

These shocks are applied at different levels of granularity of the UK SIC 2007 codes¹ to best capture how we expect the shock to play out across different sectors. For example, within the retail sector (SIC codes starting with 47000) we apply different shocks to those companies selling food compared to other retail stores. Similarly, for example, we apply different shocks to cinemas (SIC code 59140) compared to other motion picture and television activities. In total, we apply 139 different shocks across sectors that differ in their severity and persistence.

Companies seek to keep paying their labour costs, before any decision to furlough workers as part of the Coronavirus Job Retention Scheme

Given our assumption that companies seek to maintain productive capacity, we do not allow companies to lay off workers or reduce hours or wages. The exception is that we assume that companies are able to furlough workers temporarily via the CJRS while it is assumed to be in place. In ‘Step 2’ we explain how we model the impact of the announced fiscal policies on company finances in more detail. After the conclusion of the CJRS, we assume that companies reabsorb furloughed employees and continue to pay their labour costs in full.

Companies reduce their non-labour operating costs where possible

For non-labour operating costs, we split out property rental expenses and all other operating costs. These other operating costs mostly capture intermediate input costs, including goods and services. We assume that companies adjust these costs in proportion to the change in their turnover.² As explained above, this is input-output consistent because we model a fall in turnover for many of the UK companies that supply intermediate inputs to UK companies in our sample.

For rental expenses, we instead assume that companies continue to pay their obligations. This would be consistent with companies aiming to avoid entering into insolvency during the shock or after it as a result of missing rental payments (and so is also consistent with our assumption that companies continue to meet interest payments and pay suppliers for inputs already received – see below). Commercial rents are relatively small for the large companies in our sample at around 1% of turnover at the median.³

Interest expenses are fixed, although we take into account the cuts to Bank Rate

We assume that companies continue to fulfil their debt obligations and pay their interest expenses. We adjust those interest expenses to take into account the reduction in Bank Rate from 0.75% to 0.1%, as announced in March 2020 at two separate MPC meetings. We make the simplifying assumption that all UK companies have debt denominated only in GBP for the purpose of this analysis.

The accounting data does not typically identify the share of UK companies’ debt that is floating rate, so our calculation is approximate. Separate Bank staff estimates for aggregate UK corporate debt based on lender and debt securities data suggest that around half of debt is in the form of loans, which will be predominantly floating-rate, while the other half is in the form of debt securities, which will be predominantly fixed coupon.

(1) These are a standard industry classification system used by the ONS. See here for information.

<https://www.ons.gov.uk/methodology/classificationsandstandards/ukstandardindustrialclassificationofeconomicactivities/uksic2007>

(2) To test this assumption we ran a historical regression of annual non-labour costs on turnover (in logs) and a number of controls, including company and year fixed effects. The regression was weighted by turnover, with weights constructed using the Business Structure Database of the ONS. This gave a coefficient estimate of between 0.9 and 1 for most sectors, suggesting that companies were generally able to reduce their non-labour costs with turnover historically. This work was produced using statistical data from ONS. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research data sets which may not exactly reproduce National Statistics aggregates.

(3) Companies that have mortgages secured on property are assumed to continue paying their interest expenses.

Taking a simplifying assumption, we assume that around half of the rate reduction is passed through to companies. We assume that individual companies' interest expenses are reduced for the duration of the shock by the 0.65 percentage point decrease in Bank rate, multiplied by their total debt and by the 50% factor to proxy for potential floating-rate debt. We ignore the potential refinancing of fixed rate debt into floating rates through the scenario for the purpose of our calculation.

The following formula sets out how we calculate interest expenses for individual companies, denoted by i , in quarter t .

$$\text{interest expenses}_{it} = \text{interest expenses}_{i,0} + (\text{total debt}_{i,0} \times -0.0065 \times 0.5)$$

Corporation tax is paid at the same rate as before the shock

In the scenario we assume that companies continue to pay their corporation tax during the period of the shock. This is because corporation tax is generally due nine months after the financial year-end, which means that companies could be liable for corporation tax due on profits made in the previous year and face a cash outflow in the current year. It is difficult to estimate the specific corporation tax due for an individual company just from its financial accounts as it is subject to various allowances and accounting policies not observed.

We take account of available information to calculate the profits on which corporation taxes are levied. We compute earnings after interest paid plus depreciation on land and buildings, as these are generally not deductible under UK capital allowances. We then apply the 19% UK corporation tax rate and assume that companies pay their tax bill equally over the nine-month period after which they booked in their profits.¹

Capital expenditure is sufficient to cover depreciation

We assume that the majority of companies maintain their capital stock through the shock. We proxy for the maintenance level of capital expenditure using the rate of depreciation reported in company profit and loss accounts. We apply this assumption in the model by allowing companies to reduce their investment to the minimum of their average reported depreciation and investment. This means that companies whose previous year's investment was below depreciation continue investing at last year's rate so that we do not model an increase in capital expenditure for any company.

Working capital evolves with turnover, creating an outflow in 2020 Q2 for most net trade debtors

We model the dynamics of trade credit to estimate implied impacts on company cash flows. To do this we assume that trade debits and trade credits recorded on company balance sheets change in line with turnover through the scenario. These are accounting items that mostly reflect outstanding payments that customers owe to the company and that the company owes to suppliers, respectively. Changes in both can have significant implications for cash flows that would not necessarily be reflected contemporaneously in profit and loss accounts, which measure turnover and expenses on an accrual basis.

The following formula describes how we estimate the impact on cash flow of working capital changes for individual company i in quarter t .

$$\begin{aligned} \text{change in working capital}_{it} \\ = (\text{trade creditors}_{i,0} \times (1 + \text{shock}_{it}) - \text{trade creditors}_{i,0}) - (\text{trade debtors}_{i,0} \\ \times (1 + \text{shock}_{it}) - \text{trade debtors}_{i,0}) \end{aligned}$$

On aggregate, the sample contains larger trade debits than credits. And around 80% of companies in our sample are net trade creditors, which means they typically receive payments on their sales after they have paid costs. This creates a need for these companies to hold non-cash working capital. As turnover and costs fall, these companies will generally see cash inflows from their working capital, as they receive payments for past customer debts that are larger than the reduced payments they have to pay to suppliers, given falling costs. On the other hand, net trade debtors face cash outflows as turnover declines because they have to pay large outstanding bills to suppliers for goods and services already received.

(1) Some companies with larger profits have to pay their corporation taxes earlier, either partly or fully in the current accounting period. Our estimates could therefore overstate tax payments by large companies this year.

The assumptions we use to model the dynamics of trade credit imply that companies meet their outstanding trade bills in the scenario. In the event that some companies manage to delay or suspend payment of trade bills, this would boost the cash flows of some companies in our sample at the expense of others. Any withdrawal of trade credit insurance or other forms of invoice or working capital financing might have a similar effect, which we do not model here.

We assume that the level of inventories does not change through the scenario.¹ In theory, companies could sell inventory to help fill cash-flow deficits. In practice, that is likely to be more difficult in current circumstances. For example, companies in the beverage serving sector may struggle to sell beer inventory, given that other companies in their sector are also closed.

Companies facing negative cash flows cut dividends and buybacks to zero

We assume that companies with negative pre-distribution cash flows reduce all shareholder payouts, including dividends and share buybacks, to zero.²

Step 2: Estimating the implied cash-flow deficit after taking into account the fiscal policy response

We model the direct effects on company finances of Government policies that have been announced by the Government to support companies through the shock

A number of fiscal policies have been announced to support businesses through the Covid-19 shock (see MPR). Many of these would provide some form of boost to company cash flows that would directly reduce the cash-flow deficit that is brought about by the shock in our analysis. We have modelled the impact of these policies on company finances under the assumption that all eligible companies in our sample take them up. If companies opted not to take them up, then the aggregate cash-flow deficit would be larger.

The following formula sets out how we estimate the post fiscal policy cash-flow deficit for individual companies, denoted by i , in quarter t .

$$\begin{aligned} \text{Cash flow deficit after policy}_{it} &= \text{Cash flow deficit before policy}_{it} - \text{Coronavirus Job Retention Scheme payment}_{it} \\ &\quad - \text{residual pay of furloughed workers}_{it} \pm \text{VAT deferral}_{it} - \text{business rates relief}_{it} \\ &\quad - \text{cash grants}_{it} \end{aligned}$$

The aggregate cash-flow deficit after taking into account fiscal policy is defined analogously to the pre-policy aggregate deficit defined in ‘**Step 1**’ above.

We have not estimated the fiscal costs of the policy measures announced to support companies

We are not seeking to cost the fiscal measures announced by the Government in this exercise. We are narrowly focused on the impact of the measures on the cash-flow deficit that companies might face as a result of the shock. Our company level sample is not the appropriate vehicle to assess the full economic or fiscal impact of the policies. Our sample is not representative of the whole UK corporate sector and we do not have detailed enough information to form accurate estimates of the fiscal costs of the policies. Our modelling should be taken as a very rough approximation of the effects of the policies on company finances only. **Table 5** reports the OBR’s latest costings of the fiscal measures that we model in our analysis.

(1) An alternative would be to assume that companies adjust inventory consistently with turnover. This would imply a reduction in inventory in 2020 H1 and then a recovery in 2020 H2, as turnover recovers. Consistent with that, a sensitivity check using this assumption produces a reallocation of the cash-flow deficit over time with little overall effect. See Section 7 for more details.

(2) We assume that companies with positive turnover shocks maintain payouts and that companies with negative turnover shocks but positive cash flows reduce payouts in line with the turnover shock.

Table 5 There are a number of fiscal policy measures that could support company cash flowsBusiness support fiscal policy measures^(a)

Fiscal policy measure	Description of impact on company finances	Latest OBR fiscal costing
Coronavirus Job Retention Scheme	Payment of 80% of furloughed worker wages up to a maximum of £2,500 per month. Plus pensions and Employer National Insurance contributions. We assume companies do not opt to pay residual labour costs of furloughed workers.	£49 billion
VAT deferral	VAT payments due between 20 March 2020 and 30 June 2020 can be delayed to the end of March 2021.	No impact in 2020-21
Business rates relief and cash grants	No business rates owed for companies in retail, hospitality and leisure sectors. Cash grants paid based on number of low valued properties.	£28 billion

Sources: Policy announcements, HM Government, Bank of England.

(a) See the OBR website for the latest fiscal costings and more details. <https://obr.uk/coronavirus-analysis/>.

The Coronavirus Job Retention Scheme allows companies to furlough workers and receive cash payments from the Government to cover their labour compensation

We have modelled the impact of the CJRS in reducing labour costs and boosting company cash flows. Early data suggest that applications for furlough have been received from 800,000 companies covering over 6 million jobs. We assume that furloughing of employees reduces labour costs by only around 75% of the turnover shock that we apply in the scenario for the quarters in which it is in place. This is because we assume that around 25% of the fall in turnover reflects a fall in turnover per employee while formal social distancing measures are in place.

This implies that there is a fall in profit margin for most companies through the shock because total labour costs fall by less than turnover in percentage terms, so unit labour costs increase. As discussed in more detail in Section 1 of the MPR, factors such as working from home, new systems and procedures, and disruptions to domestic or international supply chains could reduce efficiency temporarily. And some companies may choose to operate at less than full capacity with staff working fewer hours than usual, which would also lower turnover per employee.

Formally, we apply the following formula.

$$\ln\left(\frac{\text{labour costs}_{it}}{\text{labour costs}_{i,0}}\right) = 0.75 \times \ln\left(\frac{\text{turnover}_{i,0} \times (1 + \text{shock}_{it})}{\text{turnover}_{i,0}}\right)$$

The CJRS pays companies 80% of the wage costs of employees who have been furloughed temporarily, up to a maximum of £2,500 per month. We model this policy in our company level data by estimating average labour compensation for all companies in the sample. We do this by dividing total labour costs by the total number of employees for each company. We use average labour compensation to estimate what the average worker that is furloughed in each company would receive, taking into account the £2,500 monthly cap in the scheme. From this, it is straightforward to compute the implied reduction in compensation.

The accounting data makes modelling the Coronavirus Job Retention Scheme difficult in practice

Our company data has three limitations with regard to calculating the impact of the CJRS on company finances. First, the cap on CJRS compensation means that the distribution of compensation across employees matters for sizing its overall effect on labour compensation. Our data set only contains total compensation across all employees per company, not its distribution, so this calculation is necessarily an inaccurate approximation. The bias will depend on how the wages of employees that get furloughed compare to the average wage earner in a company.

Second, we model the policy with reference to total labour compensation and not just to wage costs. We do this because we do not have complete data on wages and salaries. The 80% limit and the £2,500 cap under the CJRS both reference wage costs. The scheme then covers Employer National Insurance contributions and minimum pension contributions of furloughed workers in addition to their wages.

Third, our company level data includes workers outside the UK who, if they are not on their employer's PAYE payroll, would not be eligible for the CJRS. This is likely to be particularly true for the larger more international

companies in our sample. The extent to which this matters in our calculation depends on whether there are similar job retention schemes in the countries where those employees work. This may not be a source of major bias, given that there are similar schemes in place in many large advanced economies.

We assume that the CJRS payment from the authorities comes in the same quarter as the furloughing. This means there is no time lag between companies paying out labour costs and receiving the cash they get in compensation.

In the scenario we assume that companies do not opt to top up the pay of furloughed workers

In line with the illustrative scenario in the MPR, we assume that companies do not choose to pay the residual incomes of the workers that they furlough. This is a limiting assumption, but it is the limit that is most consistent with information from the Bank's Agency contacts, which suggests that topping up of wages is limited.

We model the announced VAT deferral, which redistributes company cash flows through the year

The Government has announced that companies can defer Value Added Tax (VAT) payments that they owed to HMRC for the March to June period this year. The policy allows companies to pay their VAT bills for this period at the end of the financial year instead. We assume that all companies take advantage of the VAT deferral and that they smooth their payments over the rest of the financial year to 2021 Q1. This serves to redistribute cash outflows that would have occurred at the peak of the turnover shock in 2020 Q2 across the remainder of the year, reducing the cash-flow deficit overall.

Our company level data is derived from standard financial accounts, which typically do not record VAT payments or receipts. We estimate VAT receipts based on a constant proportion of turnover, which we vary according to whether or not the company's sector is likely to face a reduced rate of VAT, or an exemption.¹ We estimate VAT payments in a similar way based on costs. We net off VAT payments from receipts to estimate the amount owed to HMRC in 2020 Q2.

We crudely estimate the impact on cash flow of business rates relief and cash grants for vulnerable sectors, although our numbers are likely to be underestimates for these policies

The Government has announced a number of other policies to provide a direct boost to company cash flows through the shock, many of which are targeted at SMEs in vulnerable sectors. Companies in the retail, hospitality and leisure sectors, as well as nurseries, do not have to pay their business rates this year. There are cash grants available to some very small companies and to companies in the retail, hospitality and leisure sectors.

To estimate the impact of the business rates relief policy measure, we first identify all companies that fall into the list of eligible sectors. Where available, we use data on company rental expenses to estimate rateable values. Where we have data on the value of property that the companies own, we multiply this by an assumed commercial property yield of 6% to estimate their imputed rental expenses. We then estimate business rates payments by multiplying their implied and actual rental expenses by a business rates multiplier. We assume that companies in the eligible sectors do not pay their business rates from 2020 Q2 to 2021 Q1.

We estimate the impact of cash grants using the same method that we use to estimate rateable values for the business rates relief policy measure. We have to make an additional assumption about the number and rateable values of individual properties held by the business. To do so, we make a simplifying assumption that companies on average make around £500,000 per year in turnover from each of their properties to produce a rough estimate of the number of properties that each company might hold.² We then estimate eligibility for cash grants based on the number of properties that a business has under the rateable value thresholds in the schemes.

The estimates we produce for the impact of business rates relief and cash grants on the corporate sector are sizeable underestimates. We have very poor data on business rates paid and the factors used to assess eligibility for the grants. We also have very low coverage of the smallest companies in the economy, many of whom are most

(1) See here for more details on the VAT rates that companies charge. <https://www.gov.uk/vat-companies/vat-rates>.

(2) This is a rough assumption. It is broadly consistent with, for example, the average annual turnover for a pub in the UK.

<https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/articles/economiesofalesmallpubscloseaschainsfocusonbigbars/changesintheukpubsandbarssector2001to2019>.

likely to benefit from these policy measures (see **Box 3** of the FSR for more details on these companies).

We do not model other fiscal policy interventions, due to data limitations

The Government has announced a wide range of other policy measures to support company finances through the Covid-19 shock. These include measures relating to tax payments, protection of renters, sick pay and for the self-employed. We have not estimated the impact of these policies on company finances because our data is not well suited to model their effects. The key reason for this is that many of the smallest companies in the UK economy do not appear in our sample, and a lot of the policy measures are targeted at them.

Box 1 Modelling the Covid-19 shock for individual companies in our sample

An illustrative example of how we model the implications of the Covid-19 shock for company finances is shown in **Table A**. We have constructed company accounting variables for a fictitious example company and detailed how our exercise assumes that the shock will play out.

Our example company experiences a steep decline in turnover of more than 80% in 2020 Q2 relative to the quarter before the shock. This company is assumed to be part of the ‘Restaurants and mobile food service activities’ sector, which is heavily affected by the shock whilst social distancing measures are in place. We assume that the company retains its workforce through the shock apart from where it furloughs a share of its workers, equal to around 75% of its turnover shock, via the CJRS. Labour costs fall slightly as a result of the assumption that the company does not opt to top up the pay of workers that it furloughs. The payment that the company is assumed to receive from the Government via the CJRS for the workers that are furloughed is shown in a separate row, lower down the table. Other operating costs fall in line with the turnover shock apart from property rental expenses, which are unchanged. Taken with the change in labour costs, this leads to negative profits (EBITDA) in 2020 Q2. We assume that the company maintains capital expenditure at a level sufficient to avoid depreciation, and that the company continues to pay interest and corporation tax. Given that the example company was a net trade debtor before the shock, the decline in turnover in 2020 Q2 leads to a cash outflow from working capital. As turnover recovers in later quarters the company will benefit from a cash inflow through this channel.

This example company has positive pre-shock free cash flow and so does not have a cash-flow deficit before the shock hits. The shock leads to a cash-flow deficit in 2020 Q2.

Table A The shock could lead to large cash-flow deficits for some companies in 2020 Q2

Indicative example of how the Covid-19 shock might affect company finances

£ million (negative numbers in parentheses)	Pre shock	2020 Q2
Profit and loss account		
Turnover	100	18
Labour costs	(40)	(34)
Rental expenses	(5)	(5)
Other operating costs	(45)	(8)
EBITDA	10	(29)
Balance sheet		
Trade debtors	10	2
Trade creditors	30	5
Cash flow statement		
EBITDA	10	(29)
Capex	(5)	(3)
Interest	(3)	(3)
Corporation tax	(1)	(1)
Shareholder payouts	(2)	-
Coronavirus Job Retention Scheme (CJRS)	-	23
Change in working capital	10	(16)
Cash-flow deficit (sum of cash flows, if negative)	-	30

Sources: Bank of England.

5 Comparable recent external studies

Few external studies have assessed corporate cash-flow deficits through Covid-19

A small number of external studies have attempted to answer a similar question to that addressed in our exercise. Goldman Sachs published the results of an exercise for the US, using data on 3,000 large companies, which suggested an aggregate new cash-flow deficit of \$90 billion this year. Though the assumptions differed, that exercise is broadly comparable to ours.

A recent paper, [Banerjee et al \(2020\)](#), analysed the cash buffers and credit lines of 40,000 companies across 26 countries, concluding that a revenue fall of 25% in 2020 would mean that 40% of companies in the median country would be unable to cover 2020 operating expenses and interest payments with their buffers and revenues. A [blog post](#) by staff at the World Bank used tax data to assess the effects of a Covid-19 scenario on companies using administrative tax records. Under assumptions similar to ours, they estimated that only 18% of companies would be profitable after a 3 month output loss. An academic working paper, [De Vito and Gomez \(2020\)](#), estimated how long companies in a panel of advanced countries could withstand a drop in turnover before exhausting cash buffers. In the most extreme scenario modelled in the paper, around 10% of companies were estimated to exhaust all cash-flows after 6 months.

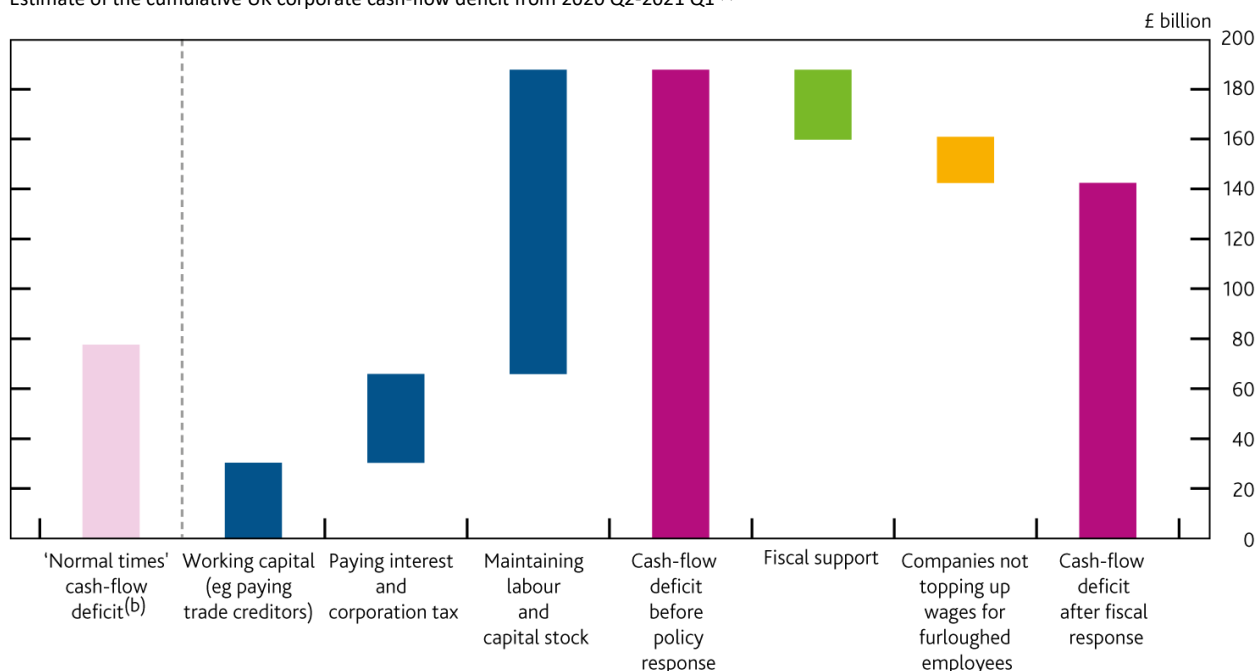
6 Results: cash-flow deficit estimates

We estimate that there would be £188 billion in cash-flow deficit this year without fiscal policy

Before accounting for cash flows from trade credit, interest and corporation tax payments, we estimate that the turnover shock has a large cash-flow impact of around £122 billion over the next year (**Chart 3**). This is the sum of individual cash-flow deficit estimates across all of the UK companies in our sample that have a deficit over the period from 2020 Q2 to 2021 Q1. It conditions on UK companies seeking to maintain their productive capacity by maintaining employment and the capital stock at pre-shock levels.

Chart 3 Fiscal policy measures, such as the Coronavirus Job Retention Scheme, support the corporate sector and reduce the estimated cash-flow deficit

Estimate of the cumulative UK corporate cash-flow deficit from 2020 Q2-2021 Q1 ^(a)



Sources: S&P Capital IQ; Fame (Bureau van Dijk); Bank of England; Bank calculations.

(a) See Section 4 of this document for the full detail on the methodology used.

(b) 'Normal times' cash-flow deficit based on the latest available data, before dividend distributions and share buybacks.

Our assumption that UK companies continue to pay interest and corporation tax increases this deficit by £36 billion, relative to a counterfactual of no interest or corporation tax payments. Many trade debtors in our sample face large cash outflows early in the year and trade creditors face outflows later in the year, which increases the deficit by another £30 billion over the course of the year.

This leaves a total cash-flow deficit for UK companies of around £188 billion absent the impact of fiscal policy measures. This is considerably larger than the ‘normal times’ cash-flow deficit of £78 billion that our method would imply if we mechanically applied it to the latest pre-shock data.¹ For context, net UK corporate financing flows totalled almost £45 billion in 2019.²

Fiscal policy measures and furloughing significantly reduce the cash-flow deficit to around £140 billion

The final column of **Table 6** shows the estimated impact of Government fiscal policy measures in reducing this cash-flow deficit in the financial year 2020-21. Assuming that companies take full advantage of the measures designed to support their cash flows, the policy measures reduce the overall cash-flow deficit by around £28 billion over the year. Our assumption that they do not pay the residual labour costs for furloughed workers reduces the deficit by a further £18 billion.

These measures combined reduce the £188 billion cash-flow deficit by around a quarter compared to a scenario without the policies in place. The CJRS is by far the largest contributor to this reduction in cash-flow deficit in our sample. As discussed above, our estimates of the impacts of other measures are likely to be underestimates given data limitations.

The quarterly cash-flow deficit is likely to decline over the year as turnover recovers

Table 6 and **Chart 4** show how the cash-flow deficit might be distributed over the next year. Unsurprisingly, the large turnover shock in 2020 Q2 translates into a large cash-flow deficit of around £82 billion. This falls substantially to £47 billion when we take into account fiscal policy measures, which mitigate some of the cash-flow deficit and help to smooth some of the rest over the following quarters.

If turnover recovers as assumed in this illustrative scenario, then we would expect a gradual decline in the deficit over the rest of the year, with around a £20 billion deficit in 2021 Q1 before and after policy measures.

Table 6 The cash-flow deficit is estimated to decline over the coming year

Estimate of the cumulative UK corporate cash-flow deficit from 2020 Q2 – 2021 Q1 ^(a)

<i>£ billions</i>	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2020-21
Cash-flow deficit without policy response	82	54	33	19	188
+ Fiscal policy impact (including not topping up pay of furloughed workers)	-35	-18	+5	+3	-46
Cash-flow deficit after fiscal policy response	47	36	38	22	142

Sources: S&P Capital IQ; Fame (Bureau van Dijk); Bank of England; Bank calculations. Numbers may not add up due to rounding.

(a) Fiscal support contributes positively to the cash-flow deficit in 2020 Q4 and 2021 Q1 as companies are assumed to pay the VAT that they owed in 2020 Q2, as part of the VAT deferral policy.

Most companies have a cash-flow deficit but many have relatively small deficits

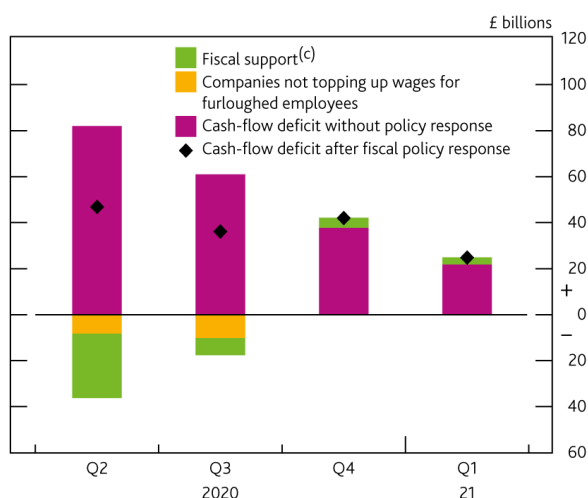
Chart 5 summarises the distribution of the cash-flow deficit as a share of turnover across companies in our sample. More than 60% of companies in the sample are estimated to have a cash-flow deficit of any size over the next year. However, for many companies the deficit is small relative to turnover. Only around 10% of companies have a deficit that is more than 25% of their turnover, and these companies account for a very small share of total turnover.

(1) The differences between the ‘normal times’ and the post shock, pre-policy cash-flow deficit is driven by (i) the turnover shock we apply in the illustrative Covid-19 scenario, along with the adjustments in costs and working capital cash-flows that we assume at the same time; (ii) the assumption that some companies cut capital expenditure to maintain productive capacity in the indicative Covid-19 scenario.

(2) This includes issuance of new bank debt, non-bank debt and equities.

Chart 4 The estimated cash-flow deficit declines over the 202-21 financial year

Estimated UK corporate cash-flow deficit by quarter from 2020 Q2-2021 Q1 (a) (b)



Source: ONS; S&P Capital IQ; Fame (Bureau van Dijk); Bank of England; Bank calculations.

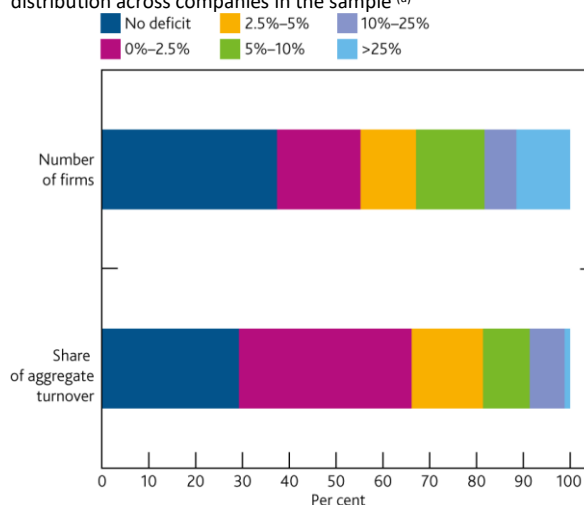
(a) See Section 4 of this document for the full detail on the methodology used.

(b) See table 6 for more detail.

(c) Fiscal support contributes positively to the cash-flow deficit in 2020 Q4 and 2021 Q1 as companies are assumed to pay the VAT that they owed in 2020 Q2, as part of the VAT deferral.

Chart 5 Less than half of companies have a cash-flow deficit larger than 2.5% of their annual turnover

Estimate of the cumulative UK corporate cash-flow deficit after fiscal policy response from 2020 Q2-2021 Q1 as a share of turnover, distribution across companies in the sample (a)



Source: ONS; S&P Capital IQ; Fame (Bureau van Dijk); Bank of England; Bank calculations.

(a) See Section 4 of this document for the full detail on the methodology used.

The shock more than doubles the number of companies in our sample with a cash-flow deficit

Table 7 compares the results to the total 'normal times' pre-shock cash-flow deficit estimates from the data set. This shows that the shock more than doubles the number, and trebles the turnover, of the companies that face a cash-flow deficit in the sample.

Table 7 The shock is estimated to leave around 55,000 companies with a cash-flow deficit

UK companies with an estimated cash-flow deficit

	Estimated cash-flow deficit (£ billion)	Number of companies with a cash-flow deficit (out of 84,174)	Share of turnover in sample with a cash-flow deficit
'Normal times' cash-flow deficit (a)	78	24,341	19%
Cash-flow deficit after fiscal policy response (2020 Q2-2021 Q1 cumulative)	142	54,385	71%

Sources: S&P Capital IQ; Fame (Bureau van Dijk); Bank of England; Bank calculations.

(a) The 'cash-flow deficit before COVID-19 shock' sums negative free cash-flows across UK companies in the latest annual data, which is generally 2018-19. It assumes that companies pay their full capital expenditure, not a maintenance level, and that only companies with positive cash flows pay dividends, for the purpose of comparison with the illustrative Covid-19 scenario.

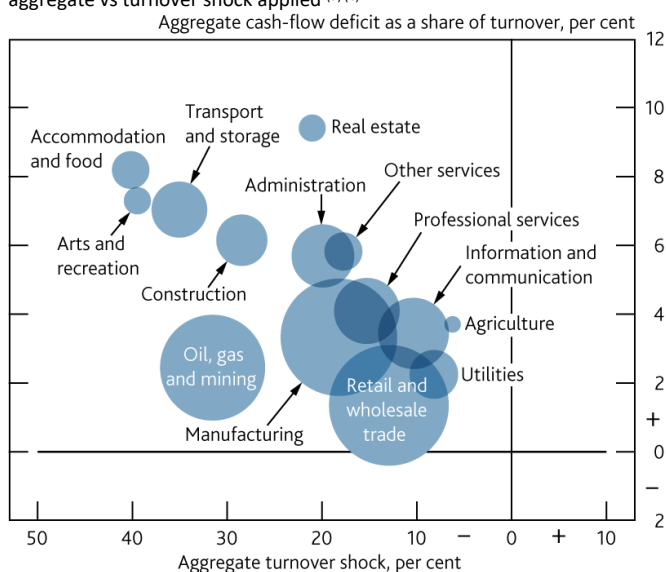
The sectors facing the largest turnover shocks face the largest cash-flow deficits

Chart 6 shows the individual company results aggregated to the sector level. Sectors facing the largest aggregate turnover shocks over the next year face the largest aggregate cash-flow deficits when measured as a share of their turnover. And in those sectors a greater share of companies face a cash-flow deficit of any size.

Companies in the accommodation and food, arts and recreation and transport and storage sectors are likely to face the largest turnover shocks this year. Consistent with that, we estimate larger aggregate cash-flow deficits in these sectors and larger shares of companies in these sectors with a cash-flow deficit of any size.

Chart 6 The sectors suffering larger turnover shocks tend to face larger cash-flow deficits

Estimate of the cumulative UK corporate cash-flow deficit after fiscal policy response from 2020 Q2-2021 Q1, as a share of turnover for sectors on aggregate vs turnover shock applied ^{(a) (b)}



Source: S&P Capital IQ; Fame (Bureau van Dijk); Bank of England; Bank calculations.

(a) The bubble sizes are in proportion to total turnover in the sector in the latest company accounts.

(b) Other services include public administration and defence, compulsory social security, education, human health and social work activities, and other services.

Companies that had low profit margins and low interest coverage pre shock face larger cash-flow deficits

Our results imply that companies that went into the shock with lower interest coverage ratios (ICRs) and lower profit margins are more likely to face cash-flow deficits. They also face larger cash-flow deficits as a share of their turnover than other companies.

Companies that were net trade debtors before the shock also tend to have larger estimated cash-flow deficits in our exercise, especially in 2020 Q2. The retail and accommodation and food sectors are net trade debtors on aggregate in our sample, which means that many companies in these sectors could face cash outflows in 2020 Q2 as turnover declines.

Large companies account for a large share of the aggregate cash-flow deficit

Table 8 breaks down the cash-flow deficit by companies across the turnover distribution in our sample. It shows that large companies with at least £500 million in turnover contribute around 60% of the estimated cash-flow deficit over the next year. This represents just 704 large companies but it is 52% of turnover in the sample.

Table 8 The estimated cash-flow deficit is mostly accounted for by large companies

UK companies with an estimated cash-flow deficit from 2020 Q2-2021 Q1, split by company size

	Estimated aggregate cash-flow deficit (£ billion)	Number of companies with a deficit	Share of turnover in whole sample with a deficit
Cash-flow deficit after fiscal response	142	54,385	71%
≤ £10 million	10	39,131	1%
£10-45 million	16	10,210	5%
£45-250 million	25	3,821	9%
£250-500 million	11	519	5%
> £500 million	80	704	52%

Sources: S&P Capital IQ; Fame (Bureau van Dijk); Bank of England and Bank calculations.

Small companies with less than £10m in turnover have an estimated cash-flow deficit of around £10 billion on aggregate. These companies account for just 1% of turnover in the sample. However, this represents almost 40,000 companies. As discussed above, our data set has very poor coverage of these companies, so this is likely to be a material underestimate of their cash-flow deficits (see **Box 3** in the FSR).

7 Uncertainty around the cash-flow deficit estimates

The estimates of cash-flow deficit are subject to considerable uncertainty

Our estimates of the cash-flow deficit conditional on the illustrative Covid-19 scenario are highly uncertain. They depend heavily on the assumptions and judgements we have made about the scenario and how the shock will affect companies.

It should also be noted that it is an accounting exercise. We have not attempted to model how companies will behave in response to the shock and how that behaviour could feed back to the wider economy.

We have conducted a range of sensitivity checks to illustrate how our results could change under alternative assumptions

Given the uncertainty, we have estimated how sensitive the cash-flow deficit estimates are to alternatives for some of the more important assumptions. In general, the most material of these sensitivity checks suggest a rough range of +/-£50 billion around the baseline cash-flow deficit estimates we have presented here.

Our assumptions for the dynamics of non-rent operating costs are important in driving results

One of the biggest uncertainties is around the response of operating costs to a fall in turnover. We expect total input costs in the economy to decline as final demand falls. And our turnover shock estimates are consistent with the assumption that non-labour, non-rent costs fall in proportion to turnover. However, in practice there will likely be important differences in adjustment across companies, as some companies in some sectors find it easier to reduce their input costs than others, especially in the short term.

We estimate that if non-labour, non-rent costs fell by 90% of the fall in turnover, instead of falling by the same amount as turnover, the cash-flow deficit could be around £30 billion higher over the year. If they fell by 85% of the turnover shock, the deficit could be £49 billion higher. We have not attempted to model the knock-on implications for companies who are providers of intermediate inputs.¹

If trade credit evolved more slowly than turnover this would reduce our cash-flow deficit estimates

We assume in our headline results that trade debits and credits move in line with turnover. This likely implies that companies pay their outstanding trade bills promptly, even at the height of the shock. If we instead assumed that there was some sluggishness in trade credit through the scenario, so that trade credit only changed by 85% of the changes in turnover, this could decrease the cash-flow deficit over the year by around £10 billion. This impact partly reflects that net trade debtors contribute significantly to the aggregate cash-flow deficit that we estimate, especially in 2020 Q2.

An extreme assumption that trade credit does not adjust at all with turnover in the coming quarters would lead to a £45 billion reduction in the aggregate cash-flow deficit. This would be consistent with scenario where all companies postpone payments through the shock until turnover recovers.

An assumption that inventories change through the shock could smooth company cash flows

Alternatively, companies could sell off stock they currently hold in their inventories to generate cash. This would reduce the cash deficit in 2020 Q2 but result in a substantial increase in cash-flow deficit later in the year as companies are assumed to rebuild their stock when turnover recovers to pre-shock levels. This would net out to little change across the year as a whole.

(1) A smaller fall in intermediate input costs should go hand-in-hand with higher turnover in some sectors. So, this experiment likely over-estimates the cash-flow deficit.

Relaxing our assumption that companies maintain productive capacity would have an ambiguous effect

Our assumption that companies seek to maintain productive capacity gives us different implied paths for capital expenditure and labour costs than are implicit in the illustrative MPR scenario. Our assumption is consistent with aggregate capital expenditure being roughly 35% lower than pre-shock throughout the scenario. This is a smaller fall in 2020 Q2 than implied by the business investment path in the illustrative MPR scenario.

Our assumption that labour costs are maintained, apart from through furloughing, differs from the illustrative MPR scenario, in which unemployment rises sharply in the near-term to 9% in 2020 Q2. As discussed above, our exercise is not intended to model how companies might behave. Instead, it is intended to provide a mechanical estimate of the amount of financing that might be required so that companies do not have to lay-off workers or reduce productive capacity in other ways, purely to meet cash-flow deficits.

Assuming instead that companies maintained their pre-shock investment would increase the deficit

We assume that companies maintain their pre shock levels of productive capital, unless they were already investing below the rate of depreciation before the shock. If we assumed that those companies increased their investment from pre-shock levels up to the rate of depreciation, this would increase our aggregate cash-flow deficit estimate by £12 billion.

If instead we assumed that all companies chose to maintain their level of investment from before the shock, the cash-flow deficit would rise significantly by £47 billion. This reflects that many companies were investing above maintenance level before the Covid-19 shock.

An assumption that companies maintain their shareholder payouts could materially increase deficits

We assume that companies with negative pre-distribution cash flows cut dividends and share buybacks to zero. An extreme assumption that those companies maintain dividends and share buybacks at the level in the latest company accounting data would increase the aggregate cash-flow deficit by as much as £100bn.

Most of our data on company finances is from the 2018-19 financial year

We have compiled the most up-to-date company accounting data available, but most of that data is from the 2018-19 financial year.¹ Capital structures, cost bases, profitability and working capital positions will have evolved since then, which will mean that the current financial position of many companies will differ. The relative stability of the UK economy and the UK corporate sector in general during 2019 suggests that an aggregate estimate that did incorporate a full set of 2019-20 accounts might not be materially different.

8 Interpretation of the cash-flow deficit estimates

The cash-flow deficit we estimate assumes that companies maintain productive capacity

The estimates we have produced are conditioned on an assumption that all companies maintain their pre-shock level of productive capacity. This is a useful benchmark. If companies are able to maintain productive capacity, then the economic downturn would ultimately prove temporary. This benchmark is not, however, intended to represent a socially optimal outcome. As in any given year, such an outcome would involve some companies dissolving, with their labour and capital reallocated in more productive ways.

Although maintenance of productive capacity is a useful benchmark, in reality some companies will opt not to maintain their productive capacity through the shock. This would be consistent with the sharp fall in business investment in the illustrative MPR scenario, as well as the steep rise in unemployment. For this reason, the results we have presented here should not be interpreted as a forecast for debt or equity that UK companies will raise or seek to raise.

There are reasons why credit demand might be lower than the cash-flow deficit we estimate

Our cash-flow deficit estimate should not be interpreted as an estimate of corporate credit demand for two reasons. First, a cash-flow deficit can be filled in many ways. This includes, but is not limited to, drawing on existing

(1) Around 15% of accounts in our data set are for the 2019-20 financial year.

credit facilities, depleting cash balances, new borrowing from banks or non-banks, raising equity or selling illiquid assets. Second, how companies choose to respond to cash-flow deficits is subject to considerable uncertainty. Many may choose not to take on debt to weather the shock, and some will go bankrupt.

Gross lending to the corporate sector could be much higher than the deficit because of refinancing

If all companies decided to fill their cash-flow deficit by issuing new debt, this could map to an implied number for total net lending to UK companies by the financial system this year. As discussed above, it is unlikely that all companies would seek to fill their cash-flow deficit by taking on debt. However, even if they did, this would be an underestimate of the total gross flow of credit to UK companies this year. This is because the deficit estimates do not take into account debt that is due to mature this year. In many cases, companies will need to refinance this maturing debt, and will rely on the financial system to provide new financing to meet it. In some cases, companies may choose to refinance maturing debt into bank debt via one of the Government loan schemes (see FSR).

We have not taken into account companies building cash buffers if they do not face cash flow issues

An alternative way of interpreting our cash-flow deficit estimates is as the financing that would be required to prevent companies from running down their cash balances or drawing on existing credit facilities. However, it is possible that some companies with good access to finance may choose to raise new debt or equity to build resilience or because they want to insure against a shock that is larger than the one we model in our scenario. The academic literature has emphasised precautionary motives for corporate liquidity management.¹ This channel would create additional demand for financing that is not reflected in our cash-flow deficit estimates. We know that some large companies have already been drawing down heavily on existing revolving credit facilities, potentially for these reasons (see FSR).

We have not attempted to model potential intra-quarter cash-flow deficits

We have divided the annual accounting data we collected into quarters, as a rough way of capturing cash-flow deficits that could come at pinch points that arise within the year. This is particularly relevant in 2020 Q2 in the illustrative scenario. However, it is important to note that this approach will not take into account cash-flow pinch points that arise within quarters, for example due to mismatches in the timing of receivables and payables. This might lead to higher cash-flow deficits for some companies than the numbers we present here.

The sample covers companies that access the UK financial system, but they may have non-UK operations

We have no way of determining what proportion of business reported in the company accounting data we have collected refers to the UK operations of companies. Many large companies that are UK-incorporated will have sizeable non-UK operations, and some of them are multinational companies that operate in multiple jurisdictions. Simple measures of the geographical split of company sales will not resolve this problem, given that they conflate non-UK operations with exports from the UK to customers outside of the UK. We have attempted to manually strip out any large companies that operate outside of the UK and do not access the UK financial system. However, for these reasons, the cash-flow deficit estimates we present here should be interpreted as estimates of the deficit for a sample of companies that access the UK financial system, nor estimates of companies whose operations contribute only to UK GDP or employment.

We do not have data on the smallest companies in the corporate sector

As **Table 3** shows, our data set has very low implied coverage of companies with less than £10m in total turnover. This is because many of the smallest companies do not file public accounting information. **Box 3** in the FSR qualitatively discusses how the shock could play out for these small companies and summarises the measures that have been announced to support them. In interpreting the cash-flow deficit results, it is important to bear in mind that they primarily cover medium and large companies. They will be underestimates of the total cash-flow deficit for all UK companies through the shock.

(1) See for example 'Corporate Liquidity Management: A Conceptual Framework and Survey', Almeida et al. (2014).

9 How might companies meet cash-flow deficits?

Some of the companies with a cash-flow deficit may seek to raise new debt to address them

The estimated £142 billion aggregate cash-flow deficit is around three times annual net lending to UK companies, which stood at around £45 billion in 2019. There are various ways in which the deficit could be met. At one extreme, if all companies with a cash-flow deficit were prepared to deplete all cash balances available before the Covid-19 shock, the aggregate cash-flow deficit would fall by around £85 billion (**Chart 7**). Existing cash balances, therefore, likely have a role to play in meeting cash-flow deficits. However, this calculation overstates that role.

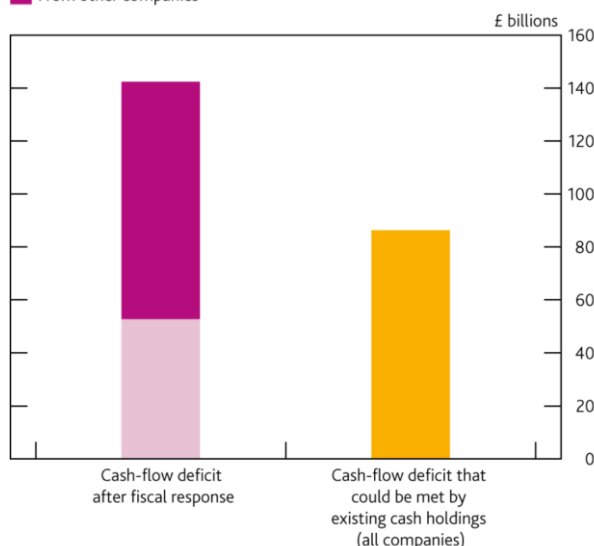
There are other ways that companies could seek to address their cash-flow deficits without recourse to new borrowing. This includes selling illiquid assets and raising equity. However, many companies will seek to take on additional debt, both to maintain their productive capacity and to build precautionary cash buffers. Net bank lending to UK companies increased to over £30 billion in March, up from an average of just over £1 billion per month over the past three years. The pick-up was mainly driven by drawing on existing credit facilities, and net corporate deposit flows picked up by around the same amount, which might suggest a precautionary motive. In addition, issuance of corporate bonds by investment-grade companies surged in April (**Chart 8**).

The FSR contains more details on the Government and Bank of England schemes that have been announced to support lending to UK companies. This includes the Bounce Back Loan Scheme (BBLs), the Coronavirus Business Interruption Loan Scheme (CBILs) for SMEs, its equivalent for larger companies (CLBILs) and the Covid Corporate Financing Facility (CCFF).

Chart 7 Cash balances can reduce some of the aggregate cash-flow deficit. Additional debt may not be the most appropriate form of finance for some companies

Estimate of the cumulative UK corporate cash-flow deficit after fiscal policy response from 2020 Q2-2021 Q1 ^{(a) (b)}

- From companies with low credit rating, high leverage or that were unprofitable pre-Covid 19 shock ^(b)
- From other companies



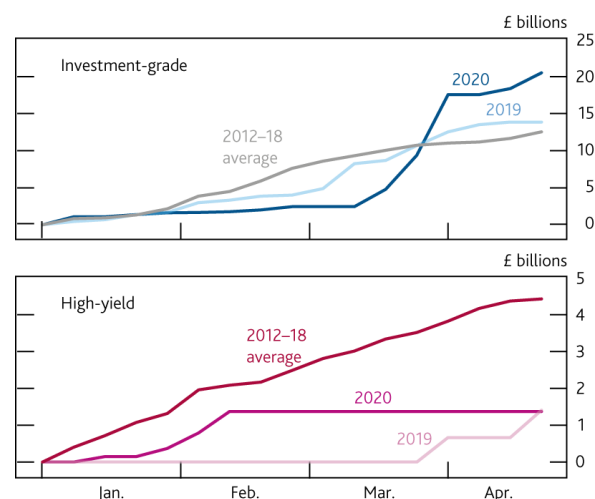
Source: S&P Capital IQ; Fame (Bureau van Dijk); Bank of England; Bank calculations.

(a) See Section 4 of this document for the full detail on the methodology used.

(b) Aggregate cash-flow deficit arising from companies that either had a net debt to EBITDA ratio above 4, low credit rating, or made negative profits on average in the past three years. Credit ratings are proxied where unavailable. Companies with these characteristics would have likely found it more difficult to get a loan from the core banking system even in the absence of the Covid-19 shock and in many cases would have been unwilling to take on additional debt.

Chart 8 Corporate capital market issuance halted during March before investment-grade issuance surged

Cumulative bond issuance by UK companies ^(a)



Source: Refinitiv – Deals Business Intelligence; Bank calculations.

(a) Euro, sterling and US dollar issuance.

However, some companies might find it difficult to take on additional debt

Some of the companies estimated to have a cash-flow deficit may not be willing or able to take on additional debt. For example, around £50bn of the aggregate £142bn cash-flow deficit comes from companies that had a low credit rating, high leverage or were unprofitable before the Covid-19 shock (**Chart 7**). These companies would have likely

found it difficult to take on additional bank debt even in the absence of a stress. They might struggle to access non-bank finance in the near term, given that issuance in leveraged finance markets has been weak (**Chart 8**).

Traditional debt products may not be the appropriate source of additional finance for some of these companies. They might require cash injections via their owners or formal public or private equity markets. Equity markets remain open and a wide range of UK companies raised capital in April. There is also evidence that private equity markets are active and capable of providing further finance to UK corporates. Globally, private equity funds are estimated to have \$1.5 trillion of unused committed capital that could be used to inject equity into companies that require finance, including those in the UK. Some companies have foreign corporate owners, which are not included in our sample, some of which could provide funds to the UK companies they own in various ways, including through transferring existing cash. In some cases, companies may meet a cash-flow deficit via forbearance, either from lenders, landlords or suppliers. If their cash-flow deficits are not filled, some companies may choose or may be forced to wind up.

The FSR summarises the results of further analysis of the effects on UK banking sector impairments of the possibility that companies with a cash-flow deficit are unable to access finance.