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The demand for loan guarantees in the UK 1981–2018: time series analysis

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ABSTRACT
Loan guarantee schemes are the primary public policy for addressing credit rationing of smaller firms across the world. In this paper we use four decades of data from the UK scheme to examine how sensitive demand for guaranteed loans is to the two main scheme parameters, the interest rate premium and guarantee coverage rate, as well as the state of the macroeconomy. Using an error correction model, we find that demand is particularly sensitive to the interest rate premium and to a lesser extent the guarantee coverage. In economic crisis periods, demand naturally increases which explains their use in Covid-19.

KEYWORDS
SME finance; bank loans; loan guarantees; credit rationing; policy intervention

JEL CLASSIFICATION
G21; G28; H81

I. Introduction and background

The Loan Guarantee Scheme is a policy intervention in capital markets that aims to facilitate lending to credit constrained small businesses that would otherwise struggle to access loans from the banking sector. The UK government has implemented a Loan Guarantee Scheme (LGS) since 1981 and has frequently modified elements of the scheme in response to changing market conditions and the apparent financing needs of the SME sector. The demand for, or take-up, of loans within the LGS has varied considerably over this period as have the parameters of the scheme rules (Cowling 2010; Cowling and Clay 1995). Figure 1 shows the patterns in the number of guaranteed loans in time. The peaks coincide with the main economic downturns in the pre-covid period – the early 1980s, early 1990s and the global financial crisis of 2008 (GFC).

The study of loan guarantee schemes often mirrors crisis periods when governments expand their schemes to support credit to SMEs. This is reflected in the international representation of recent studies during the GFC and COVID-19 (Corredera-Catalán, di Pietro, and Trujillo-Ponce 2021; Cowling, Liu, and Ledger 2012; Taghizadeh-Hesary et al. 2021; Xia and Gan 2020; Yang et al. 2021). However, the association between the schemes' main parameters and the volume of lending is an under-researched area, with Cowling and Clay (1995) and Bachas et al. (2021) being notable exceptions. Analyses of longer periods are rare. To fill this gap, in the paper, we analyse the 40-year period of intervention of the LGS (1981–2018), with the aim of understanding the impact of two main parameters – the interest rate premium and guarantee coverage – on overall LGS demand and on the process of dynamic adjustment.

We find that a one percentage point increase in the interest rate premium is, ceteris paribus, associated with a long-term decrease in the number of loans by about 1,650. Similarly, an increase in the government guarantee coverage by five percentage points is associated with a long-term increase in the number of loans by about 800 per annum. There is evidence that a substantial part of the long-term effects materializes in the first year after the change of parameters. The long-term equilibrium number of loans is impacted by economic conditions. There are signs of short-term overreaction to adverse economic conditions, and a substantial increase in the demand for loans was associated with the global financial crises.

Our results contribute to the literature on the design and adjustment of loan guarantee schemes. At the same time, they can inform economic policy related to the implementation of a new loan guarantee scheme in the aftermath of the COVID-19 pandemic. The paper is structured as follows: Section II introduces data and methodology,

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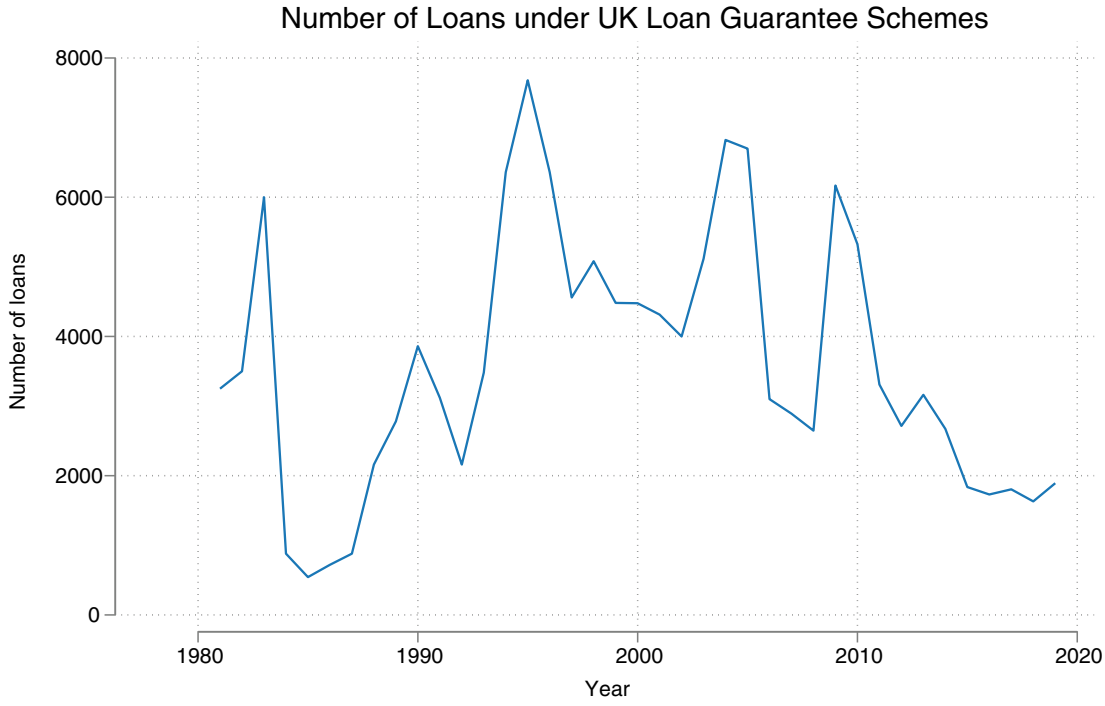

Figure 1. UK loan guarantee schemes (number of loans) 1981–2019.

Section III discusses the results, and Section IV concludes.

II. Data and methodology

We analyse the annual data from 1981 to 2018. Our model specification assumes that absent shocks, the long-run equilibrium in the number of loans issued under LGS is determined by the scheme parameters and economic conditions. The scheme parameters are the interest rate premium and guarantee coverage. Nine variables were tested as potential proxies of economic conditions: gross added value (deflated), firm surplus (deflated), number of self-employed people, average house price (deflated), GDP (deflated), Bank of England bank rate, number of employed people, gross fixed capital formation (deflated) and number of unemployed people. To select the best proxy, principal component analysis was employed.

The analysed variables are likely encumbered by non-stationarity. To avoid a danger of spurious results, we employ cointegration analysis and error correction modelling (ECM). At the same time, ECM is a theoretically driven approach and allows estimating both short-term and long-term effects, whereby it elucidates the dynamic adjustment process.

We used two-step Engle–Granger approach to build ECM. The first step involves estimation of the long-term equilibrium model in levels, where all variables must be integrated of order one. The long-term model specification is:

$$Loans_t = a_0 + a_1 Premium_t + a_2 Coverage_t + a_3 Conditions_t + u_t \quad (1)$$

Where variable *Conditions* is a proxy for economic conditions, i.e. one of the macroeconomic variables mentioned above. Cointegration is tested using the Engle and Granger test, i.e. the residuals from equation (1) are tested for stationarity. The second step of the Engle–Granger two-stage approach is the estimation of the error correction model:

$$\Delta Loans_t = b_0 + b_1 e_{t-1} + b_2 \Delta Premium_t + b_3 \Delta Coverage_t + b_4 \Delta Conditions_t + v_t \quad (2)$$

Where Δ is the symbol for the first difference and e_{t-1} is the error-correcting term representing

Table 1. Unit root test results.

	Levels		First differences	
Variable	Lags	DF-GLS tau	Lags	DF-GLS tau
Number of loans	1	−2.789	2	−5.350***
Interest rate premium	6	−2.583	5	−5.891***
Guarantee coverage	1	−2.931	1	−3.536***
Gross added value (deflated)	1	−2.425	1	−3.607***
Firm surplus (deflated)	1	−1.289	1	−3.161***
Number of self-employed	2	−1.892	1	−2.686***
Average house price (deflated)	1	−1.522	1	−2.725***
GDP (deflated)	1	−2.210	1	−3.497***
Bank of England bank rate	1	−3.153*	1	−4.408***
Number of employed people	1	−2.981*	1	−3.622***
Gross fixed capital formation (deflated)	1	−2.673	1	−3.056***
Number of unemployed people	1	−3.207*	1	−3.402***

The table shows unit root test results using Dickey-Fuller GLS test (Elliott, Rothenberg, and Stock 1996). The number of lags in the test equations was selected using minimum SIC criterion. The results for time series in levels are presented in column two and three, whereas the results for time series in differences are shown in column four and five. For both levels and first differences, the first figure presents the selected number of lags and the second test statistics. The statistical significance of the test is denoted with asterisks (* $p < 10\%$, *** $p < 1\%$). The null hypothesis of the test assumes non-stationarity.

Table 2. Estimation results for the long-term equilibrium models.

	(1) Number of loans	(2) Number of loans	(3) Number of loans
Interest rate premium	−1602.0	−1682.2	−1686.2
Guarantee coverage	157.1	155.7	172.0
Number of self-employed	−1.399		
Total employment		−0.378	
Gross fixed capital formation (deflated)			−0.0102
Constant	537.6	6381.1	−3287.9
Observations	38	38	38
Adjusted R^2	0.492	0.511	0.509
Engle–Granger cointegration test	−4.516**	−4.474**	−4.465**

The table shows the estimation results for the long-term equilibrium models. The dependent variable is the number of loans issued under the loan guarantee scheme. The estimation sample runs from 1981 to 2018. The parameters are estimated using the ordinary least squares method. The Engle–Granger cointegration test statistics are displayed in the last row and their statistical significance is denoted with asterisks (** $p < 5\%$).

the lagged deviation from the long-term equilibrium. We employed the same explanatory variables as those in the long-run equilibrium models, with the aim to gain insights into the process of adjustment. Unlike the long-term equilibrium model, all variables in model (2) are stationary.

III. Results

Dickey–Fuller GLS tests confirm that all variables are integrated of order one (see Table 1).[1] Before testing for cointegration, macroeconomic variables are inspected using principal component analysis. Economic conditions can be explained by two factors. The first factor accounts for approximately 85% of the total variability, represents economic growth and is closely aligned with the first eight out of nine variables. The second factor explains about 10% of the total variability and is closely aligned with unemployment.[2]

In line with the Engle–Granger two-step procedure, we estimated potential long-term equilibrium models and found cointegrating relationships between the number of loans, interest rate premium, coverage, and three proxies of economic growth – the number of self-employed, total employment and gross fixed capital formation (see Table 2).[3] The results show that an increase in the interest rate premium by one percentage point is associated, all else equal, with a decrease in the number of loans issued under the loan guarantee scheme ranges from 1,602 to 1,686. An

[1] All variables contained unit root in levels and were stationary in first differences, based on lag length selected using minimum SIC criterion. The Dickey-Fuller GLS test is a modified version of the Dickey-Fuller t-test which has increased power under realistic conditions when an unknown mean or trend is present (Elliott, Rothenberg, and Stock 1996).

[2] The detailed results of the principal component analysis are available from authors upon request.

[3] Full estimation results are available from authors upon request. In the models, we refrain from testing statistical significance. Due to autocorrelated errors, the estimates of coefficients' standard errors might not be reliable. Nevertheless, the coefficients themselves are unbiased.

Table 3. Estimation results for the error-correction models.

	(1)	(2)	(3)
Lagged residual from the cointegrating regression	−0.673***	−0.686***	−0.705***
	(−4.18)	(−4.26)	(−4.57)
Interest rate premium (first difference)	−946.5*	−1081.1*	−1159.4**
	(−1.74)	(−1.99)	(−2.22)
Guarantee coverage (first difference)	177.8*	113.8	126.0
	(1.76)	(1.10)	(1.30)
Number of self-employed (first difference)	−1.537		
	(−0.93)		
Total employment (first difference)		−0.830	
		(−1.36)	
Gross fixed capital formation (deflated, first difference)			−0.0449**
			(−2.13)
Constant	69.39	136.8	352.1
	(0.31)	(0.58)	(1.33)
Observations	37	37	37
Adjusted R^2	0.395	0.417	0.461

The table shows the estimation results for the error-correction models. The dependent variable is the first difference for the number of loans issued under the loan guarantee scheme. The estimation sample runs from 1982 to 2018 (one observation is lost due to using lagged values). The parameters are estimated using the ordinary least squares method. The t-statistics are in parentheses and the statistical significance of the estimated coefficients is denoted with asterisks (* $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$).

Table 4. Estimation results for the error-correction models with the indicators of recessions.

	(1)	(2)	(3)
Lagged residual from the cointegrating regression	−0.604***	−0.635***	−0.631***
	(−3.86)	(−4.12)	(−4.14)
Interest rate premium (first difference)	−919.8*	−959.5*	−950.3*
	(−1.79)	(−1.91)	(−1.89)
Guarantee coverage (first difference)	186.9*	152.5	166.8*
	(1.97)	(1.63)	(1.79)
Indicator of the early 90s crisis (1991)	155.4	−21.83	−106.3
	(0.13)	(−0.02)	(−0.09)
Indicator of the global financial crisis (2009)	2868.1**	3103.2**	3105.1**
	(2.39)	(2.66)	(2.67)
Constant	−106.5	−118.7	−114.8
	(−0.54)	(−0.61)	(−0.59)
Observations	37	37	37
Adjusted R^2	0.459	0.482	0.483

The table shows the estimation results for the error-correction models with the indicators of the recessions. The dependent variable is the first difference for the number of loans issued under the loan guarantee scheme. The estimation sample runs from 1982 to 2018 (one observation is lost due to using lagged values). The parameters are estimated using the ordinary least squares method. The t-statistics are in parentheses and the statistical significance of the estimated coefficients is denoted with asterisks (* $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$).

increase in coverage by five percentage points is, all else equal, associated with an increase in the number of loans ranging from 780 to 860. The results show a very strong impact of both the interest rate premium and the guaranteed coverage on the number of loans.[4] On the other hand, the growth of economy is associated with a decrease in the number of loans.

The estimation results for the error-correction models are shown in Table 3. All models show strong error-correcting behaviour in that the coefficients for the lagged residuals are negative and statistically significant. The results indicate that each year approximately 67–71% of the deviation from the long-term equilibrium is eliminated. The short-term effects of both the interest rate premium and coverage are smaller than the overall long-run effects and suggest gradual adjustments in time. A one percentage point increase in the premium is associated with a decrease in the number of loans ranging from 947 to 1159 loans. Similarly, the effect of an increase of one percentage point of coverage is associated with an increase in the number of loans from 114 to 178. The estimated coefficient of the proxy for the overall economic climate is significant only in model 3.

[4]If the interest rate premium is too high, the scheme may cease to be of interest to firms. This may happen if the interest premium exceeds 4.57%. Similarly, if the guarantee coverage is too low, the scheme may cease to be of interest to lenders. This will happen if the coverage falls below 54.28% (Model 1, Table 2).

However, the size of effect suggests a short-term overreaction in that the estimated coefficient for the gross fixed capital formation is higher than in Table 2.

The short-run overreaction of the demand for guaranteed loans to changes in the economic climate suggests that the demand might be greatest in times of crises. The period under analysis covers two recessions – in the early 90s (from 1990 Q3 to 1991 Q3) and the global financial crisis of 2008 (from 2008 Q2 to 2009 Q2).[5] To assess whether the demand for the guaranteed loans is driven by the recessions we re-estimated models from Table 3 where we included the indicators of the recessions instead of the individual proxies for economic conditions. The models are presented in Table 4. The results show that the overreaction is driven by the increase in the number of loans during the global financial crisis when the estimated increase ranged from 2,868 to 3,105. Interestingly, the crisis in the early 90s has not impacted the volume of lending. The range of the estimated coefficients for the scheme's parameters and their statistical significance is consistent with those reported in Table 3.

IV. Conclusion

The focus of the analysis centred on understanding the effects of the main policy levers in the LGS scheme (interest rate premium and guarantee coverage), as they are varied over the period, whilst controlling for economic conditions. We confirmed that besides economic conditions the demand for the loans is significantly influenced by the scheme parameters – the interest rate premium and the guaranteed coverage. More specifically, we found that the long-run equilibrium of the demand for loans is determined by the two main parameters and economic conditions. The deviations are absorbed relatively quickly – about two-thirds of the error from the last period are eliminated within one year. The impact of the changes in the scheme's parameters is gradual with the substantial proportion of the impact materializing in the first year when the parameters are changed. The impact of the main parameters is relatively strong, and the policy-maker needs to be careful not to set parameters' values that would cause the scheme cease generating new loans – either because the interest rate premium is too high for firms, or because the guaranteed coverage is too low for lenders. We find that the demand for loans seems to overreact in the short run and the scheme generates more loans in adverse economic conditions, notably during the GFC.

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[5]The recession in the early 80s lasting from 1980 Q1 to 1981 Q1 is not included in the sample used for the estimation of the error-correction models which covers 37 years from 1982 to 2018.