

Impact of COVID-19 on sectoral insolvency rates in Austria

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Introduction and Motivation

- In a OeNB project following the COVID-19 pandemic, we propose a methodology
 - to forecast sectoral insolvency rates of Austrian corporated firms and
 - to assess the effectiveness of mitigating measures
 - with a sectoral insolvency model for Austria (SIMA) based on simulated balance-sheet data at the firm level and a macroeconomic scenario
- Basic idea of the insolvency model: a macroeconomic scenario generates stress to firms.
 Over time, both equity and liquidity positions deteriorate, causing firm insolvencies if they fall under a threshold. Mitigating measures may help preventing insolvencies.
- The results (sectoral insolvency rates) serve the following purposes:
 - From a macroeconomic perspective, they can be used to assess the loss of productive capacities (potential output)
 - From a **micro and macro prudential perspective**, they are an important input to the estimation of credit default probabilities for the banking stress test

• From a **fiscal policy perspective**, they provide an estimate of the costs of the measures

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Overview of the methodology





Overview of the insolvency model without mitigating measures



Overview of the insolvency model with mitigating measures



Balance sheet data needed to implement the insolvency model

Balance Sheet

Cash & Bank (A7)	Equity (E)					
Current assets (R13)	Current liabilities (R16)					
Trade receivables (A3)	Current bonds (L11)					
Other receivables (A41)	Current bank debt (L21)					
Financial assets (A6)	Trade payables (L4)					
Other Assets (A -A7 -CA)	Other Liabilities (L -E -CL)					
Total assets (A)	Total liabilities (L)					

Variables in Monte Carlo Simulation

Variables calculated as shares

Variables currently not used

<Variable Name> (<BACH Code>)

Profit & Loss Statement

Turnover (I1)	Cost of inputs (I5)
Changes in inventories (I2)	External input (I6)
Capitalised production (I3)	Staff costs (I7)
Financial income (I42)	Operating charges (I81)
Other income (I4 -I42)	Financial expenses (183)
	Other expenses (I8 -I81 -I83)
	Depreciation (I9)
	Interest expenses (I10)
	Tax (I11)
Total income (lt1)	Total expenses (It2)

A Monte Carlo method to simulate firm-level balance sheet data

- We use data from the **SABINA** (firm-level data) and the **BACH** (aggregated data) databases
- Due to the absence of sufficient data at the firm-level, we simulate a firm-level data set for corporated firms of 18
 variables for 17 NACE-1 sectors by means of a Monte Carlo method in 2 steps:
- 1. For our **six core variables**, we generate 100,000 draws from an **estimated multivariate distribution** that replicate the **marginal distribution for each variable** and the **correlation structure** between aggregated time series. For each variable, we estimate the marginal distribution based on the following data and distributional forms:

Variable	Source	Distribution	Remarks
Equity	SABINA	Firm-level data	Firm-level data available
Cash & bank	SABINA	Firm-level data	Firm-level data available
Total income	BACH	Normal	Estimated with data for first quartile and mean
Total expenses	BACH	Normal	Estimated with data for first quartile and mean
Current assets	BACH	Gamma	Estimated with data for first quartile and mean
Current liabilities	BACH	Gamma	Estimated with data for first quartile and mean

2. The **remaining 12 variables** of the balance sheet and the profit & loss account are given as **shares** of the six simulated variables

Marginal distributions of the simulated data set : Accomodation and food service activities (NACE I)



Results – Monthly insolvency rates with and w.o. mitigating measures



	Insolvency	rates 2020	-	thereof		Effects of mitigating government measures								
	w.o. mitigating measures	with mitigating measures	"Normal" historical insolvencies	Impact of cris	COVID sis	D								
				w.o. mitigating measures	with mitigating measures	Effects of all	measures	Marginal ef	fect of each r	neasure				
					All	Combined	Sum of	Short-term	Debt	Deferral of	Credit	Fixed cost	Packages for	Relaxed
					measures	effects	marginal effects	work	moratorium	social	guarantees	support	restaurants,	insolvency law
Impact on insolvency rates at the end of 2020										security			hotels, culture	and filing
										contributions				moratorium
	%	%	%						Percentage p	points				
	(1=3+4)	(2=3+5)	(3)	(4)	(5)	(6=1-2)	(7=8++14)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Total	61	27	10	51	2.2	_29	_27	_09	-07	-0.6	-05	-04	-03	
Agriculture forestry and fishing (A)	1.4	0.1	0.2	12	-0.1	-1 3	-12	-0.2	-10	-0.1	-0.0	0.1	0.5	0.0
Mining and quarrying (B)	0.7	0.1	0.2	03	0.1	-0.1	-01	-0.1	-0.1	-0.0	0.0	-0.0	0.0	0.0
Manufacturing (C)	6.7	3.2	0.8	5.9	2.4	-3.5	-2.8	-1.4	-1.0	-0.5	-0.2	-0.1	0.0	0.0
Electricity, gas, steam and air conditioning supply (D)	0.6	0.6	0.6	0.0	0.0	-0.0	-0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.0
Water supply & sewerage (E)	1.6	15	10	01	0.5	0.0	0.1							0.0
		1.5	1.0	0.6	0.5	-0.2	-0.1	-0.1	-0.1	-0.0	0.0	-0.0	0.0	0.0
Construction (F)	2.7	2.3	2.1	0.6	0.5 0.3	-0.2 -0.3	-0.1 -0.3	-0.1	-0.1 -0.1	-0.0 -0.0	0.0 0.0	-0.0 -0.0	0.0 0.0	0.0 0.0
Construction (F) Trade (G)	2.7 10.2	2.3 6.4	2.1 0.9	0.6 0.6 9.3	0.5 0.3 5.4	-0.2 -0.3 -3.8	-0.1 -0.3 -3.4	-0.1 -0.1 -1.6	-0.1 -0.1 -0.8	-0.0 -0.0 -0.4	0.0 0.0 -0.7	-0.0 -0.0 -0.3	0.0 0.0 0.0	0.0 0.0 0.0
Construction (F) Trade (G) Transportation and storage (H)	2.7 10.2 3.9	2.3 6.4 3.5	2.1 0.9 2.1	0.6 0.6 9.3 1.7	0.5 0.3 5.4 1.3	-0.2 -0.3 -3.8 -0.4	-0.1 -0.3 -3.4 -0.4	-0.1 -0.1 -1.6 -0.3	-0.1 -0.1 -0.8 -0.1	-0.0 -0.0 -0.4 -0.0	0.0 0.0 -0.7 0.0	-0.0 -0.0 -0.3 -0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0
Construction (F) Trade (G) Transportation and storage (H) Accommodation and food services (I)	2.7 10.2 <u>3.9</u> 24.0	2.3 6.4 3.5 8.7	2.1 0.9 2.1 1.8	0.8 0.6 9.3 1.7 22.2	0.5 0.3 5.4 1.3 6.9	-0.2 -0.3 -3.8 -0.4 -15.3	-0.1 -0.3 -3.4 -0.4 -14.7	-0.1 -0.1 -1.6 -0.3 -3.3	-0.1 -0.1 -0.8 -0.1 -2.8	-0.0 -0.0 -0.4 -0.0 -4.7	0.0 0.0 -0.7 0.0 -2.5	-0.0 -0.0 -0.3 -0.0 -3.7	0.0 0.0 0.0 0.0 -4.2	0.0 0.0 0.0 0.0 0.0
Construction (F) Trade (G) Transportation and storage (H) Accommodation and food services (I) Information and communication (J)	2.7 10.2 3.9 24.0 2.5	2.3 6.4 3.5 8.7 2.0	2.1 0.9 2.1 1.8 0.7	0.8 0.6 9.3 1.7 22.2 1.8	0.5 0.3 5.4 1.3 6.9 1.4	-0.2 -0.3 -3.8 -0.4 -15.3 -0.5	-0.1 -0.3 -3.4 -0.4 -14.7 -0.5	-0.1 -0.1 -1.6 -0.3 -3.3 -0.3	-0.1 -0.1 -0.8 -0.1 -2.8 -0.1	-0.0 -0.0 -0.4 -0.0 -4.7 -0.1	0.0 0.0 -0.7 0.0 -2.5 -0.0	-0.0 -0.0 -0.3 -0.0 -3.7 -0.1	0.0 0.0 0.0 -4.2 0.0	0.0 0.0 0.0 0.0 0.0
Construction (F) Trade (G) Transportation and storage (H) Accommodation and food services (I) Information and communication (J) Real estate (L)	2.7 10.2 3.9 24.0 2.5 0.7	2.3 6.4 3.5 8.7 2.0 0.0	2.1 0.9 2.1 1.8 0.7 0.3	0.6 0.6 9.3 1.7 22.2 1.8 0.4	0.5 0.3 5.4 1.3 6.9 1.4 -0.3	-0.2 -0.3 -3.8 -0.4 -15.3 -0.5 -1.3	-0.1 -0.3 -3.4 -0.4 -14.7 -0.5 -1.3	$ \begin{array}{r} -0.1 \\ -0.1 \\ -1.6 \\ -0.3 \\ -3.3 \\ -0.3 \\ -0.0 \\ -0.0 \\ \end{array} $	-0.1 -0.1 -0.8 -0.1 -2.8 -0.1 -1.2	-0.0 -0.0 -0.4 -0.0 -4.7 -0.1 -0.0	0.0 0.0 -0.7 0.0 -2.5 -0.0 -0.0	-0.0 -0.0 -0.3 -0.0 -3.7 -0.1 0.0	0.0 0.0 0.0 -4.2 0.0 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0
Construction (F) Trade (G) Transportation and storage (H) Accommodation and food services (I) Information and communication (J) Real estate (L) Professional, scientific & techn. services (M)	2.7 10.2 3.9 24.0 2.5 0.7 0.6	2.3 6.4 3.5 8.7 2.0 0.0 0.4	2.1 0.9 2.1 1.8 0.7 0.3 0.5	0.6 0.6 9.3 1.7 22.2 1.8 0.4 0.1	0.5 0.3 5.4 1.3 6.9 1.4 -0.3 -0.0	-0.2 -0.3 -3.8 -0.4 -15.3 -0.5 -1.3 -0.5	$ \begin{array}{r} -0.1 \\ -0.3 \\ -3.4 \\ -0.4 \\ \hline -14.7 \\ -0.5 \\ -1.3 \\ -0.1 \\ \end{array} $	$ \begin{array}{r} -0.1 \\ -0.1 \\ -1.6 \\ -0.3 \\ -3.3 \\ -0.3 \\ -0.0 \\ -$	-0.1 -0.1 -0.8 -0.1 -2.8 -0.1 -1.2 -0.1	-0.0 -0.0 -0.4 -0.0 -4.7 -0.1 -0.0 -0.0	0.0 0.0 -0.7 0.0 -2.5 -0.0 -0.0 -0.0	-0.0 -0.0 -0.3 -0.0 -3.7 -0.1 0.0 -0.0	0.0 0.0 0.0 -4.2 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
Construction (F) Trade (G) Transportation and storage (H) Accommodation and food services (I) Information and communication (J) Real estate (L) Professional, scientific & techn. services (M) Administrative and support services (N) Eduction (D)	2.7 10.2 3.9 24.0 2.5 0.7 0.6 5.3	2.3 6.4 3.5 8.7 2.0 0.0 0.4 2.8	2.1 0.9 2.1 1.8 0.7 0.3 0.5 1.6	0.6 0.6 9.3 1.7 22.2 1.8 0.4 0.1 3.7	0.5 0.3 5.4 1.3 6.9 1.4 -0.3 -0.0 1.3	-0.2 -0.3 -3.8 -0.4 -15.3 -0.5 -1.3 -0.1 -2.5	$ \begin{array}{r} -0.1 \\ -0.3 \\ -3.4 \\ -0.4 \\ \hline -14.7 \\ -0.5 \\ -1.3 \\ -0.1 \\ -1.9 \\ 0.1 \\ -0.9 \\ \hline -0.9 \\ 0.1 \\ $	$ \begin{array}{r} -0.1 \\ -0.1 \\ -1.6 \\ -0.3 \\ -3.3 \\ -0.3 \\ -0.0 \\ -0.0 \\ -1.0 \\ 0.0 \\ -1.0 \\ -0.0 \\ -1.0 \\ -0.0 \\ -1.0 \\ -0$	-0.1 -0.1 -0.8 -0.1 -2.8 -0.1 -1.2 -0.1 -0.9	$ \begin{array}{r} -0.0 \\ -0.0 \\ -0.4 \\ -0.0 \\ -4.7 \\ -0.1 \\ -0.0 \\ -0.0 \\ -0.5 \\ 0$	0.0 0.0 -0.7 0.0 -2.5 -0.0 -0.0 -0.0 -0.0	-0.0 -0.0 -0.3 -0.0 -3.7 -0.1 0.0 -0.0 -0.0 -0.1	0.0 0.0 0.0 -4.2 0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
Construction (F) Trade (G) Transportation and storage (H) Accommodation and food services (I) Information and communication (J) Real estate (L) Professional, scientific & techn. services (M) Administrative and support services (N) Education (P)	2.7 10.2 3.9 24.0 2.5 0.7 0.6 5.3 0.4	2.3 6.4 3.5 8.7 2.0 0.0 0.4 2.8 0.4 0.4	2.1 0.9 2.1 1.8 0.7 0.3 0.5 1.6 0.4	0.6 0.6 9.3 1.7 22.2 1.8 0.4 0.1 3.7 -0.0	0.5 0.3 5.4 1.3 6.9 1.4 -0.3 -0.0 1.3 -0.0	-0.2 -0.3 -3.8 -0.4 -15.3 -0.5 -1.3 -0.1 -2.5 -0.0	$ \begin{array}{r} -0.1 \\ -0.3 \\ -3.4 \\ -0.4 \\ \hline -14.7 \\ -0.5 \\ -1.3 \\ -0.1 \\ -1.9 \\ -0.0 \\ 0.4 \\ \end{array} $	$ \begin{array}{r} -0.1 \\ -0.1 \\ -1.6 \\ -0.3 \\ -3.3 \\ -0.0 \\ -0.0 \\ -0.0 \\ -1.0 \\ 0$	-0.1 -0.1 -0.8 -0.1 -2.8 -0.1 -1.2 -0.1 -0.9 -0.0 -0.0	$ \begin{array}{r} -0.0 \\ -0.0 \\ -0.4 \\ -0.0 \\ -4.7 \\ -0.1 \\ -0.0 \\ -0.0 \\ -0.5 \\ 0.0 \\ 0.0 \\ \end{array} $	0.0 0.0 -0.7 0.0 -0.0 -0.0 -0.0 -0.0 -0.	-0.0 -0.0 -0.3 -0.0 -3.7 -0.1 0.0 -0.0 -0.0 -0.1 0.0	0.0 0.0 0.0 -4.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
Construction (F) Trade (G) Transportation and storage (H) Accommodation and food services (I) Information and communication (J) Real estate (L) Professional, scientific & techn. services (M) Administrative and support services (N) Education (P) Human health and social work activities (O) Acts entertainment and momention (R)	2.7 10.2 39 24.0 2.5 0.7 0.6 5.3 0.4 0.6 281	2.3 6.4 3.5 8.7 2.0 0.0 0.4 2.8 0.4 0.2	2.1 0.9 2.1 1.8 0.7 0.3 0.5 1.6 0.4 0.4	0.6 0.6 9.3 1.7 22.2 1.8 0.4 0.1 3.7 -0.0 0.2 275	0.5 0.3 5.4 1.3 6.9 1.4 -0.3 -0.0 1.3 -0.0 -0.1	-0.2 -0.3 -3.8 -0.4 -15.3 -0.5 -1.3 -0.1 -2.5 -0.0 -0.4 -16.0	$\begin{array}{r} -0.1 \\ -0.3 \\ -3.4 \\ -0.4 \\ \hline -14.7 \\ -0.5 \\ -1.3 \\ -0.1 \\ -1.9 \\ -0.0 \\ -0.4 \\ -17.1 \end{array}$	$ \begin{array}{r} -0.1 \\ -0.1 \\ -1.6 \\ -0.3 \\ -3.3 \\ -0.0 \\ -0.0 \\ -1.0 \\ 0.0 \\ 0.0 \\ -5.0 \\ \end{array} $	$ \begin{array}{r} -0.1 \\ -0.1 \\ -0.8 \\ -0.1 \\ -2.8 \\ -0.1 \\ -1.2 \\ -0.1 \\ -0.9 \\ -0.0 \\ -0.1 \\ -1.0 \\ -0.1 \\ -1.0 \\ -0.1 \\ -$	$ \begin{array}{r} -0.0 \\ -0.0 \\ -0.4 \\ -0.0 \\ -4.7 \\ -0.1 \\ -0.0 \\ -0.0 \\ -0.5 \\ 0.0 \\ -0$	0.0 0.0 -0.7 0.0 -0.0 -0.0 -0.0 -0.0 -0.	-0.0 -0.0 -0.3 -0.0 -3.7 -0.1 0.0 -0.0 -0.1 0.0 0.0 -0.2	0.0 0.0 0.0 -4.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
Construction (F) Trade (G) Transportation and storage (H) Accommodation and food services (I) Information and communication (J) Real estate (L) Professional, scientific & techn. services (M) Administrative and support services (N) Education (P) Human health and social work activities (O) Arts, entertainment and recreation (R) Other service activities (S)	2.7 10.2 39 24.0 2.5 0.7 0.6 5.3 0.4 0.6 28.1 5.4	2.3 6.4 3.5 8.7 2.0 0.0 0.4 2.8 0.4 0.2 12.1 3.1	2.1 0.9 2.1 1.8 0.7 0.3 0.5 1.6 0.4 0.4 0.4 0.6 0.8	0.6 0.6 9.3 1.7 22.2 1.8 0.4 0.1 3.7 -0.0 0.2 27.5 4.6	0.5 0.3 5.4 1.3 6.9 1.4 -0.3 -0.0 1.3 -0.0 -0.1 11.5 2 4	-0.2 -0.3 -3.8 -0.4 -15.3 -0.5 -1.3 -0.1 -2.5 -0.0 -0.4 -16.0 -2.2	$\begin{array}{r} -0.1 \\ -0.3 \\ -3.4 \\ -0.4 \\ -14.7 \\ -0.5 \\ -1.3 \\ -0.1 \\ -1.9 \\ -0.0 \\ -0.4 \\ -17.1 \\ -1.9 \end{array}$	$ \begin{array}{r} -0.1 \\ -0.1 \\ -1.6 \\ -0.3 \\ -3.3 \\ -0.0 \\ -0.0 \\ -0.0 \\ -1.0 \\ 0.0 \\ 0.0 \\ -5.0 \\ -0.8 \\ \end{array} $	$ \begin{array}{r} -0.1 \\ -0.1 \\ -0.8 \\ -0.1 \\ -2.8 \\ -0.1 \\ -1.2 \\ -0.1 \\ -0.9 \\ -0.0 \\ -0.1 \\ -1.0 \\ -0.9 \\ -0.0 \\ -0.1 \\ -1.0 \\ -0.9 \\ -0.9 \\ -0.0 \\ -0.1 \\ -0.9 \\ -0.0 \\ -0.1 \\ -0.9 \\ -0.0 \\ -0.1 \\ -0.9 \\ -0.9 \\ -0.0 \\ -0.1 \\ -0.9 \\ -0.9 \\ -0.0 \\ -0.1 \\ -0.9 \\ -$	$ \begin{array}{r} -0.0 \\ -0.0 \\ -0.4 \\ -0.0 \\ -4.7 \\ -0.1 \\ -0.0 \\ -0.0 \\ -0.5 \\ 0.0 \\ -0.0 \\ -0.5 \\ 0.5 \\ 0.5 \\ 0.5 \\ 0.5 \\ 0.5 \\ 0$	$\begin{array}{c} 0.0 \\ 0.0 \\ -0.7 \\ 0.0 \\ -2.5 \\ -0.0 \\ -0.0 \\ -0.0 \\ -0.0 \\ -0.0 \\ -0.3 \\ -7.2 \\ -0.0 \end{array}$	$ \begin{array}{r} -0.0 \\ -0.0 \\ -0.3 \\ -0.0 \\ -3.7 \\ -0.1 \\ 0.0 \\ -0.0 \\ -0.1 \\ 0.0 \\ 0.0 \\ -3.9 \\ -0.2 \\ \end{array} $	0.0 0.0 0.0 -4.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

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