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EUROSYSTEM

A structural corporate insolvency model to predict sectoral Austrian insolvencies amid the COVID-19 pandemic and beyond

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Disclaimer

- All authors Oesterreichische Nationalbank (OeNB):
    - Jannika Hesse and Claus Puhr from the Supervision Policy, Regulation and Strategy Division
    - Martin Schneider from the Economic Analysis Division
- **Opinions expressed by the authors of the presentation do not necessarily reflect those of the OeNB or the ESCB.**
- This presentation is based on Hesse et al. (2021): “A structural corporate insolvency model to predict sectoral Austrian insolvencies amid the COVID-19 pandemic and beyond”.
- Hesse et al. (2021) is an update of Puhr and Schneider (2021): “Have mitigating measures helped prevent insolvencies in Austria amid the COVID-19 pandemic?”, published in OeNB’s “Monetary Policy and the Economy”-Series January 2021.
- It has been revisited and expanded for EBA’s Research Workshop November 2021.
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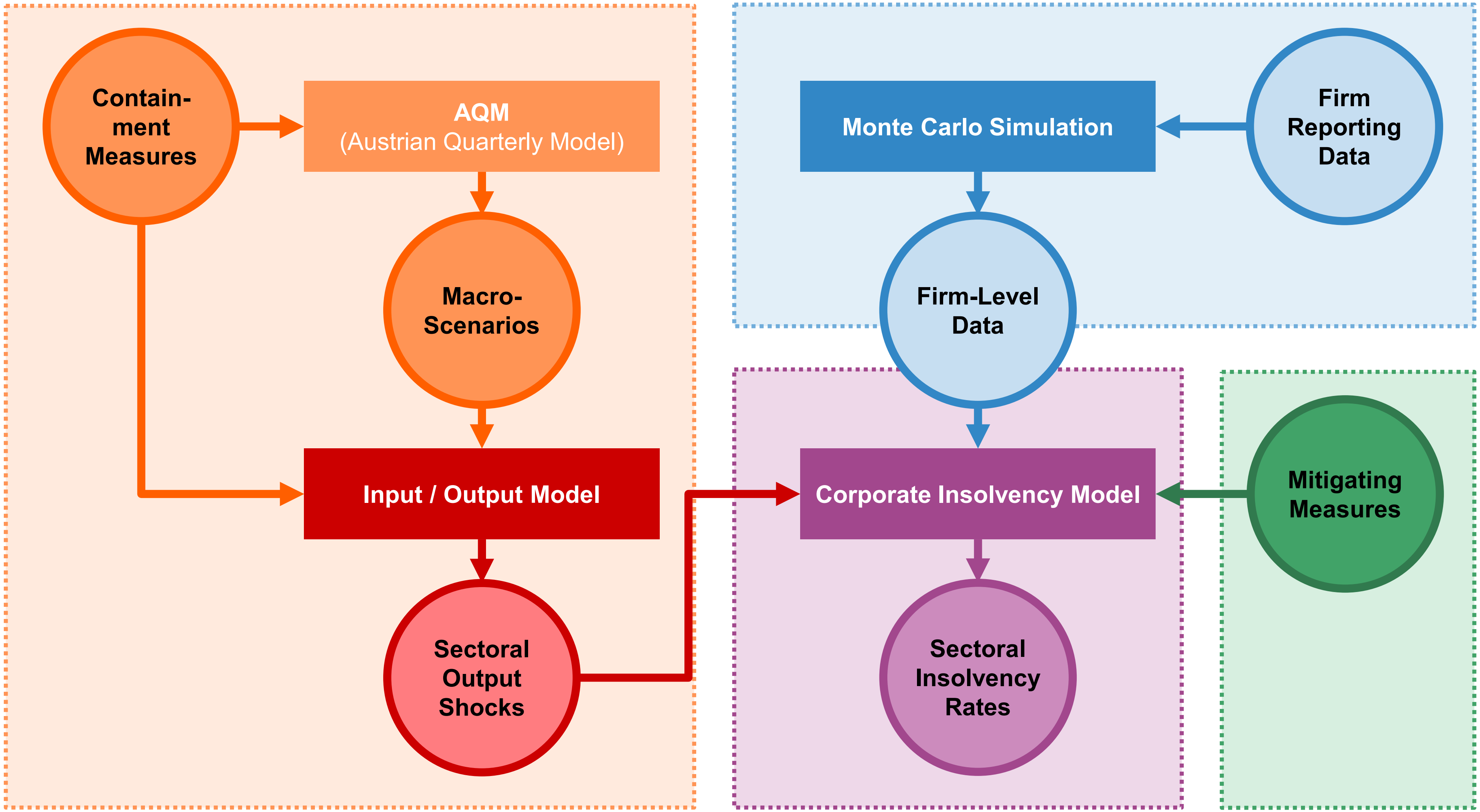
Introduction and Motivation

- In a **joint project between the economics and the banking supervision** departments following the COVID-19 pandemic we developed **a sectoral insolvency model for Austria** based on simulated balance-sheet data at the firm level and a macroeconomic scenario.

- We assess the **effectiveness and efficiency of how mitigating measures help to prevent corporate insolvencies** following AT government's containment measures to quell the spread of the COVID-19 pandemic.

- Our results (sectoral insolvency rates) **serve the following purposes**:
    - From a **macroeconomic perspective**, they can be used to assess the loss of productive capacities (lost potential output).
    - From a **fiscal policy perspective**, they provides policy makers with an estimate of the costs of the measures.
    - From a **micro and macro prudential perspective**, they are an important input to the estimation of credit default probabilities for the banking stress test and a broader vulnerability assessment of individual banks and the banking system.

A stylized view of the modelling set-up



BACH and SABINA data form the basis for firms‘ balance sheets and P&L

Balance Sheet

	Cash & Bank (A7)	**Equity (E)**	
Current assets (CA*)	Trade receivables (A3)	Current bonds (L11)	Current liabilities (CL*)
	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)	

Balance Sheet Ratios

Current to total assets (R13)	**Current to total liabilities (R16)**

Variables used in model (MC simulation)

Variables used in model (extrapolated)

Variables currently not used

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 (I83)**
	Other expenses (I8 -I81 -I83)
	Depreciation (I9)
	Interest expenses (I10)
	Tax (I11)
Total income (It1)	**Total expenses (It2)**

<Variable Name> (<BACH Code>)

**) CA & CL definitions deviate from BACH*

A Monte Carlo simulation to fill data gaps of the firm-level data set

- 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:**

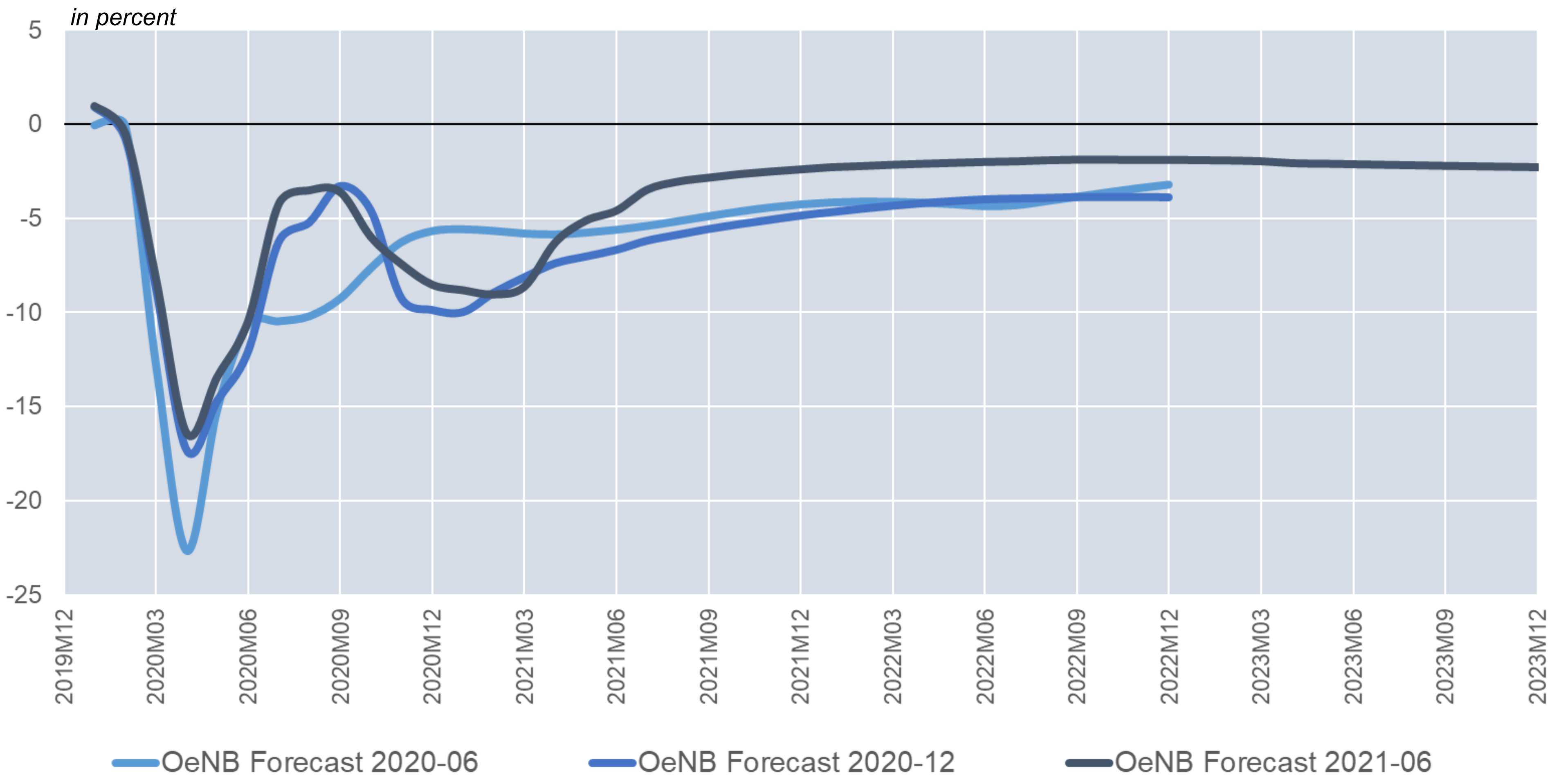
1. For our **six core variables**, we generate 100,000 draws from an **estimated multivariate distribution** that replicate the **marginal distribution for each variable** and the **correlation structure** between aggregated time series. For each variable, we estimate the marginal distribution based 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

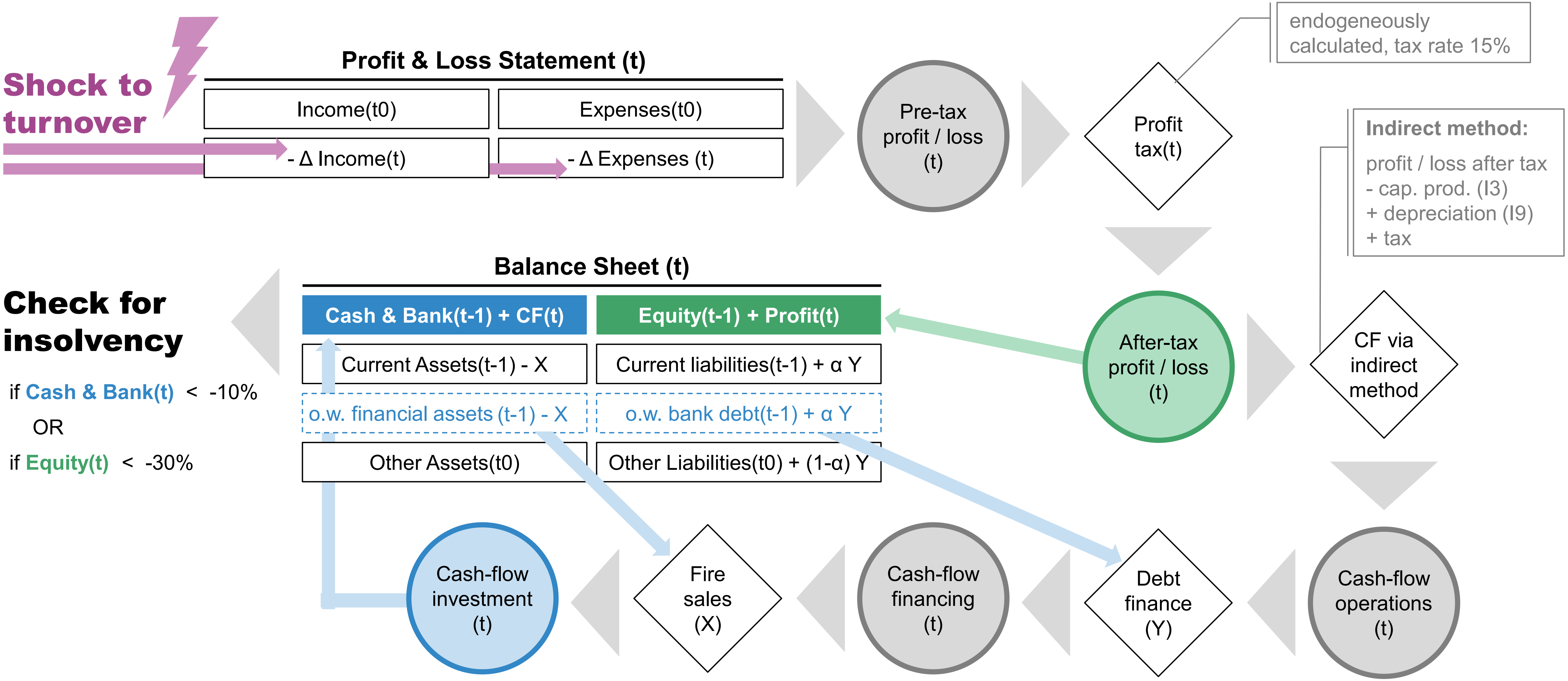
2. The **remaining 12 variables** of the balance sheet and the profit & loss account are given as **shares** of the six simulated variables

This presentation includes calculations based on three different scenarios

Aggregate output shocks based on OeNB's forecasts 2020H1-2021H1

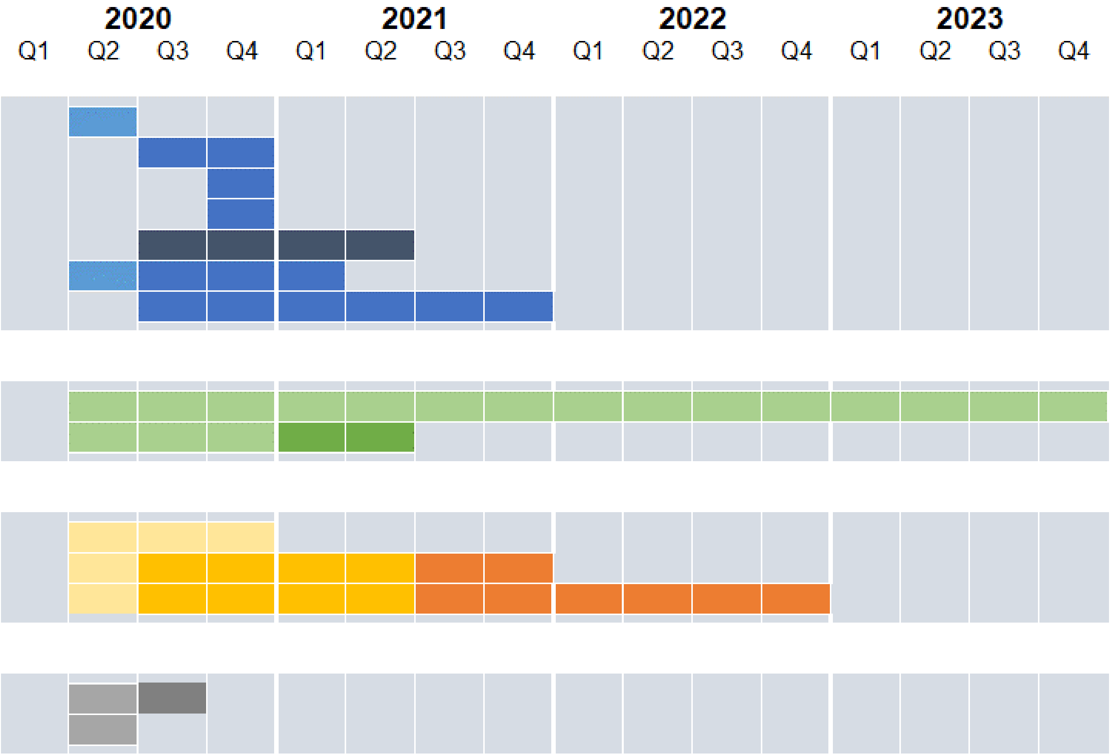


Overview of the insolvency model without mitigating measures



All AT mitigating measures aimed at corporates are included in the model

Measure	Available (EUR bn)	By who
Capital injections via grants and subsidies		
Fixed-cost support (FKZ)	**8**	Gov.
Fixed-cost support 2 (FKZ II)	**12***	Gov.
Revenue compensation (November)	**12***	
Revenue compensation (December)	**12***	
Loss compensation	**12***	
Short-term work	**11**	Gov.
Sector-specific measures	**0.6 + 0.5**	Gov.
Long-term deferrals of payment obligations		
Credit guarantees	**16**	Gov./Banks
Debt moratoria	**n.a.**	Banks
Short-term deferrals of payment obligations		
Reduction of corporate tax advance payments	**n.a.**	Gov.
Deferral of social security contributions	**n.a.**	Social Sec.
Delayed insolvency filing due to deferral	**-**	Social Sec.
Changes to the insolvency regime		
Temporary change to the insolvency law	**-**	Gov.
Suspended bankruptcy filings by the public sector	**-**	Social Sec.



*) EUR 12 bn is the earmarked total for fixed-cost support, renvenue- and loss compensation (of which EUR 9.9 bn paid-out in the model)

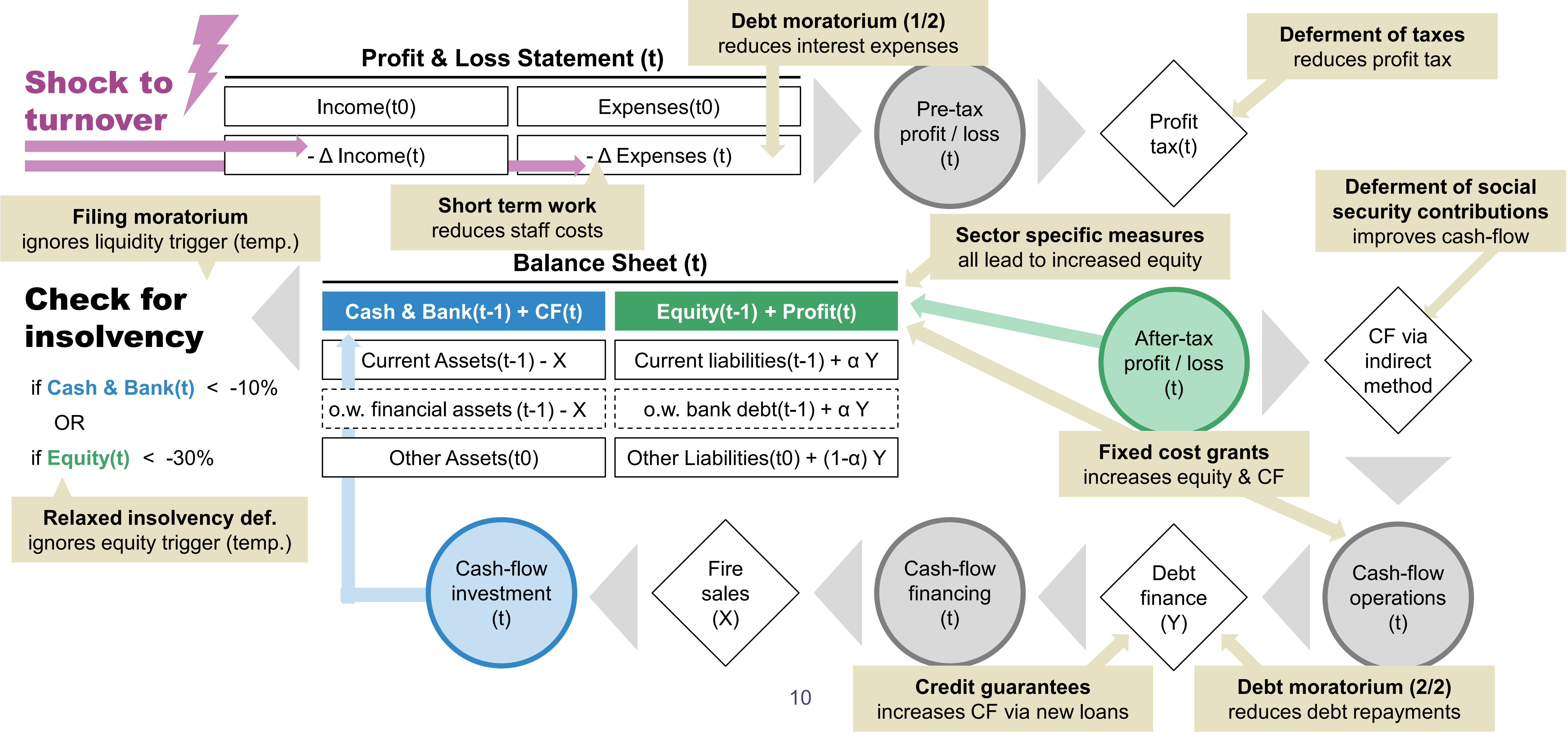
**) actual long-term liquidity support

Legend

Included from 2020-06 / Included from 2020-12 / Included from 2021-06

- Capital injections via grants and subsidies
- Long-term deferrals of payment obligations
- Short-term deferrals of payment obligations
- Changes to the insolvency regime

Overview of the insolvency model with mitigating measures



Insolvency model results from three different calculations (1/2)

Aggregate model insolvency rates with and without mitigating measures 2020H1-2021H1

Without mitigating measures

With mitigating measures

Insolvency rates 2020H1 (June 2020)

Insolvency rates 2020H2 (Dec. 2020)

Insolvency rates 2021H1 (June 2021)

Please note that results deviate from previous publications as the latest model calibration has served as the basis for all three calculations.

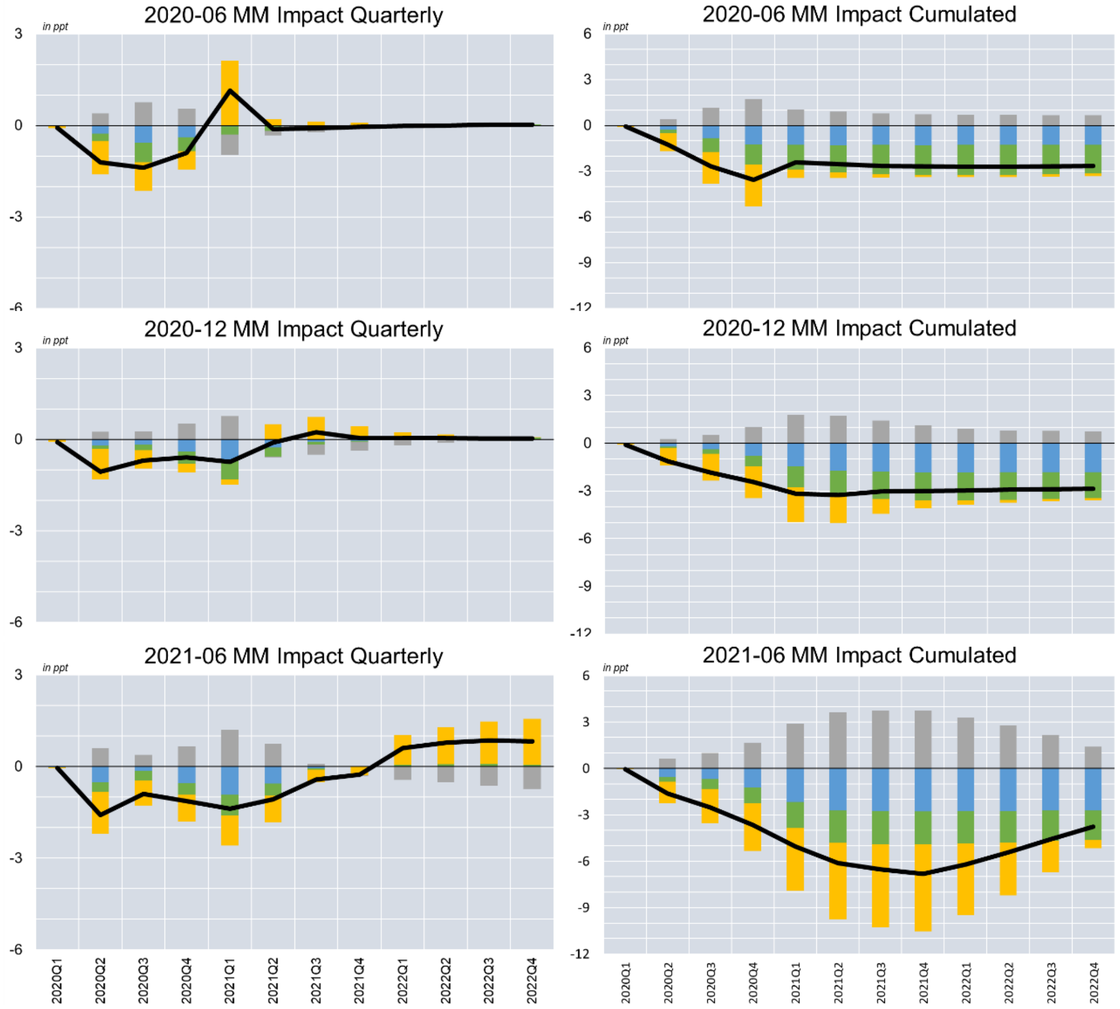
Insolvency model results from three different calculations (2/2)

Impact of the mitigating measures on the aggregate insolvency rates 2020H1-2021H2

2020H1
(June 2020)

2020H2
(Dec 2020)

2021H1
(June 2021)



MM impact on insolvency rates
Impact from capital injections
Impact from short-term liquidity support
Impact from long-term liquidity support
Simultaneity bias

Please note that results deviate from previous publications as the latest model calibration has served as the basis for all three calculations.

Conclusion

- Our corporate insolvency **model is highly stylized and relies on several heroic assumptions**. Calibrations on the (implicit) behavior of firms is done in order to replicate historic insolvency rates. This obviously leaves ample room for future improvements.
- Regarding results, so far we have **slightly overestimated insolvency rates during the COVID-19 pandemic**. Nevertheless, we were able to provide valuable input to internal and external policy discussions from all three angles we set out to pursue (the macroeconomic, the fiscal policy and the micro and macro prudential perspective).
- Most importantly, we were able to both, **assess the efficiency and efficacy of mitigating measures** as designed by the Austrian government (with early observations later confirmed by actual use of individual measures by Austrian firms) **and shed light on the impact of frictions regarding their implementation**.
- Finally, we were able to **use model output for further OeNB analyses**, foremost in the area of **top-down stress testing** (both, as part of OeNB's regular top-down solvency stress tests and our first climate risk stress test – the latter of which by expanding the insolvency models functionality).

Danke für Ihre Aufmerksamkeit

Thank you for your attention

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References

- **Guth, M., C. Lipp, C. Puhr and M. Schneider (2020):** "Modeling the COVID-19 effects on the Austrian economy and banking system", in: Oesterreichische Nationalbank (Eds.): Financial Stability Report 40, p. 63-86.
- **Guth, M., J. Hesse, C. Königswieser, G. Krenn, C. Lipp, B. Neudorfer, M. Schneider, and P. Weiss (2021):** "OeNB Climate Stress Test – Modelling Climate Risk Effects for the Austrian Banking Sector", in: Oesterreichische Nationalbank (Eds.): Financial Stability Report 42. Forthcoming December 2021.
- **Hesse, J., Puhr, C. and M. Schneider (2021):** "A structural corporate insolvency model to predict sectoral Austrian insolvencies amid the COVID-19 pandemic and beyond", an update of Puhr and Schneider (2021) for EBA's Research Workshop, 16 November 2021. Mimeo.
- **Puhr, C. and M. Schneider (2021):** "Have mitigating measures helped prevent insolvencies in Austria amid the COVID-19 pandemic?", in: Oesterreichische Nationalbank (Eds.): Monetary Policy and the Economy Q4/20 – Q1/21, p. 77-110.
- **Schneider, M. and W. Waschiczek (2021):** "Unternehmensinsolvenzen: Auswirkungen der Hilfsmaßnahmen im Jahr 2020 und Ausblick für 2021 und 2022", in: Oesterreichische Nationalbank (Eds.): Konjunktur aktuell – März 2021, p. 39-43. (German only)