The Transmission of Monetary Policy to the Cost of Hedging

An Options Order Book Perspective

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Motivation

- Macroeconomic slumps when firms or households face large uninsured risks
- Option markets are key venue for hedging risks
- Ideally: cost-efficient hedging helps to reduce risks and to mitigate macroeconomic slumps
- Role of economic policy?
- Transmission of monetary policy to hedging costs?

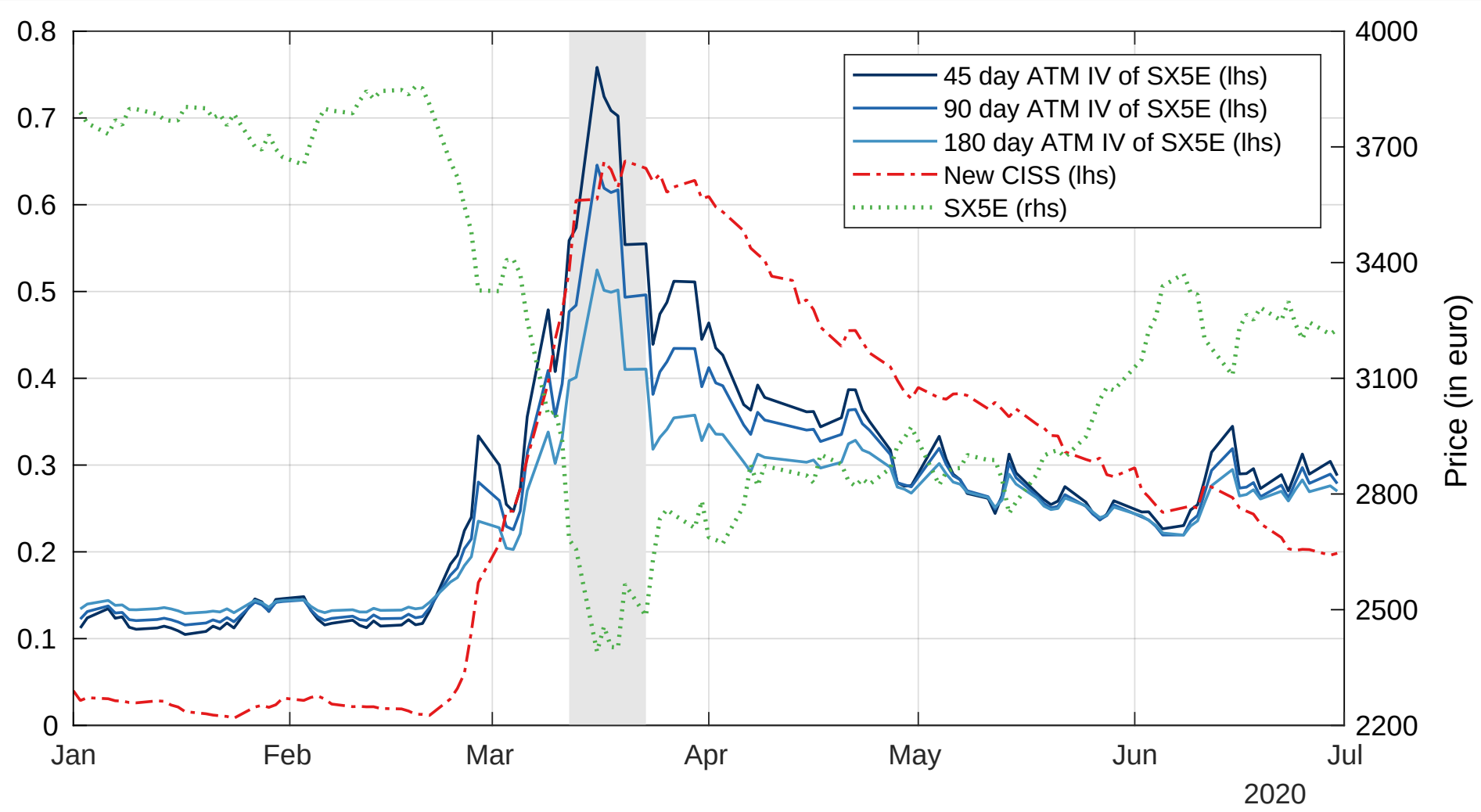
Approach

- Analyze data of option order books written on the EURO STOXX 50
  - document stylized facts
  - focus on period of pandemic shock 2020
- Intraday analysis of the effect of monetary policy decisions
- Estimate the effect of decisions by the ECB and the Fed on
  - state variables affecting option prices: value of underlying, volatility, tail risk
  - option market liquidity: spread, market depth
- Interpretation through lens of models
  - option pricing
  - market microstructure
- Quantitative implications for hedging costs

Results

- Large effect of monetary policy decisions on hedging costs
  - up to 0.5% of the portfolio value for a standard portfolio insurance strategy
- Key channel: change of volatility
- ECB decision on March 12, Fed decision on March 15: cost increase
- ECB decision on March 18, Fed decision on March 23: cost decrease

Option markets and the Covid-19 shock



pc-ratio

Data

- Order books of options written on EURO STOXX 50
- Construct data at 5-minute frequency during trading day between 9:05 to 17:25
- 124 trading days from January 1 to June 30, 2020

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Option market liquidity across moneyness and tenor

- Spreads are smallest near-the-money for all tenors, with numbers ranging between 1.6% and 4.2%

- Market depth is highest for near-the-money options, with an elasticity close to or exceeding 100
  - implication: increase of traded quantity by 100% increases the price by 1%

Informational content of options

- Options with different moneyness and tenor are informative about different state variables governing option prices
- Prices of far OTM options with short tenor are informative about tail risk (e.g., Andersen et al., 2017)
- Prices of slightly OTM options are informative about volatility
- Prices of ITM options are informative about value of the underlying

Insights on liquidity from market microstructure

- Asymmetric information
- Inventory risk
- Transaction cost

Monetary policy transmission to option markets

- Effect on state variables: volatility, tail risk, value of the underlying
- Effect on liquidity: because change of information asymmetry, inventory risk...

Effect on the underlying asset price, IV, and OTM option prices

			Tail risk	
Event date	Underlying price	IV	Put	Call
March 12	−0.055	0.063	0.710	0.44
March 13/16	−0.089	0.161	−0.20	0.63
March 18/19	−0.001	0.004	0.08	0.00
March 18/20	0.075	−0.157	−0.01	−0.02
March 23	0.017	−0.033	−0.14	−0.08

spec decisions intra-march1215

Effect on liquidity of put options

	Relative spread		Elasticity	
	[Std. moneyness range]		[Std. moneyness range]	
	$[-3,-2]$	$[-1,0]$	$[-3,-2]$	$[-1,0]$
Event date				
March 12	0.037	0.021	−5.1	−72.2
	(0.115)	(0.026)	(17.3)	(122.3)
March 13/16	0.060	0.000	2.3	32.6
	(0.125)	(0.045)	(7.7)	(45.5)
March 18/19	−0.001	−0.001	4.8	−30.6
March 18/20	−0.028	−0.001	1.0	0.3
	(0.109)	(0.032)	(7.8)	(118.2)
March 23	0.012	0.005	6.2	−48.6
	(0.089)	(0.028)	(12.9)	(183.6)

Illustration of economic interpretation

- Transaction costs cannot explain different effects on liquidity across moneyness and tenor buckets

- If no effect on state variables governing option prices as on March 18/19 $\rightarrow$ effects on liquidity rather due to changes of asymmetric information than inventory risk

Effect on hedging costs for slightly OTM options

Event date	Change in euro	Change in %
March 12	4,887	12.67
March 13/16	3,579	7.02
March 18/19	1,102	2.01
March 18/20	−7,879	−14.94
March 23	−4,407	−9.35

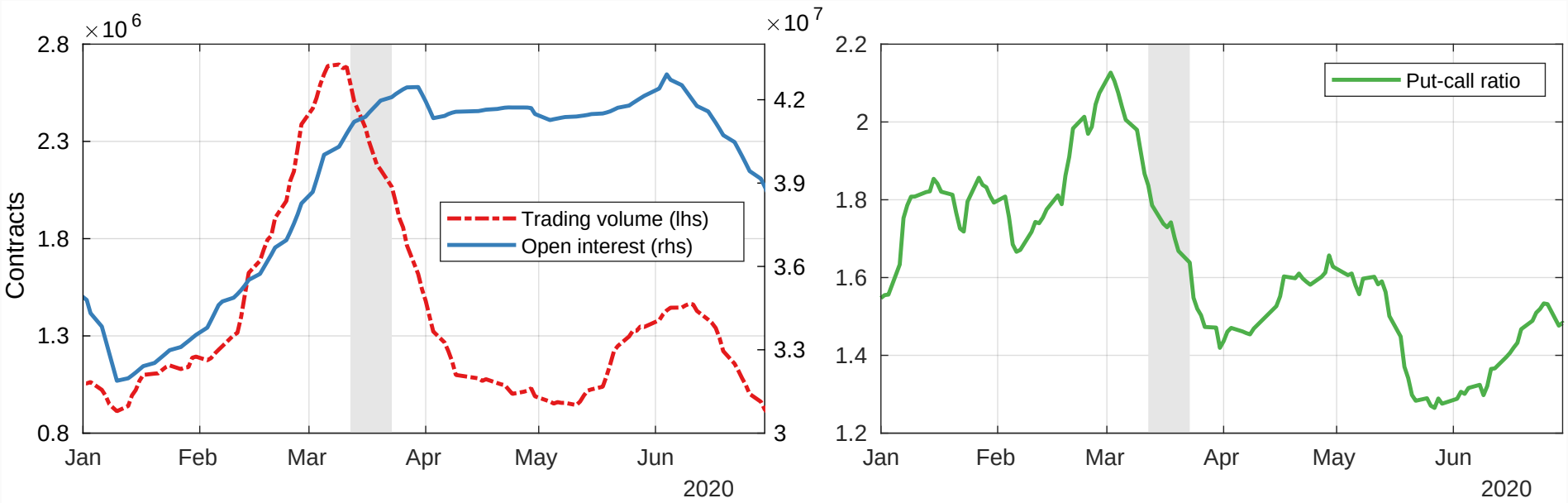
costs and vol

Conclusion

- Evidence for quantitatively relevant monetary policy transmission to hedging costs
  - Monetary policy decisions on March 12 and 15 increased hedging costs by an amount approximately equal to annual expenses of actively managed funds, or 0.5% of portfolio value
  - Monetary policy decisions on March 18 and 23 decreased hedging costs by a similar amount
- Future research
  - real effects (consumption, investment)
  - welfare implications of hedging cost changes

Appendix

Option markets and the Covid-19 shock – trading volume, open interest and put-call ratio



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Econometric specification

$$y_t = \alpha + \beta\, D_t^{(\mathrm{e})} + \sum_j \gamma_j\, D_t^{(\mathrm{e})}\, D_{jt}^{(45)} + \sum_i \delta_i D_{it}^{(5)} + \sum_d \delta_d D_{dt}^{(\mathrm{d})} + \sum_w \delta_w D_{wt}^{(\mathrm{w})} + \sum_m \delta_m D_{mt}^{(\mathrm{m})} + u_t$$

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Monetary policy decisions: March 12 and 15

- ECB's decision on March 12
  - longer-term refinancing operations (LTROs) and targeted longer-term refinancing operations (TLTRO III) to support bank liquidity conditions and thus bank lending, money market activity, and asset purchases
  - statement "we are not here to close spreads"
- Fed's decision on March 15
  - cut the policy rate by 100 basis points (bp) to $0 - 0.25\%$
  - quantitative easing measures with a volume of at least 700 billion USD

Monetary policy decisions: March 18 and 23

- ECB's decision on March 18
  - 750 billion euro Pandemic Emergency Purchase Program (PEPP)
  - goal to ensure transmission of monetary policy: "The situation was unprecedented and the repercussions were also impossible to forecast accurately. Uncertainty on the economic front was creating severe strains in the financial markets [...]. Faced with the risk of the ECB's monetary policy transmission becoming significantly impaired, there was an urgent need for the Governing Council to reassess its policy stance [...]."
- Fed's decision on March 23
  - primary and secondary market corporate credit facilities (PMCCF and SMCCF) to provide credit to companies and improve liquidity in the secondary market for corporate bonds
  - term asset-backed securities loan facility (TALF) to sustain credit to consumers and businesses
  - extended the range of municipal securities that qualified for the commercial paper funding facility to sustain credit to municipalities
  - continue with asset purchases in the "amounts needed."

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Intraday evidence for March 12 and 15

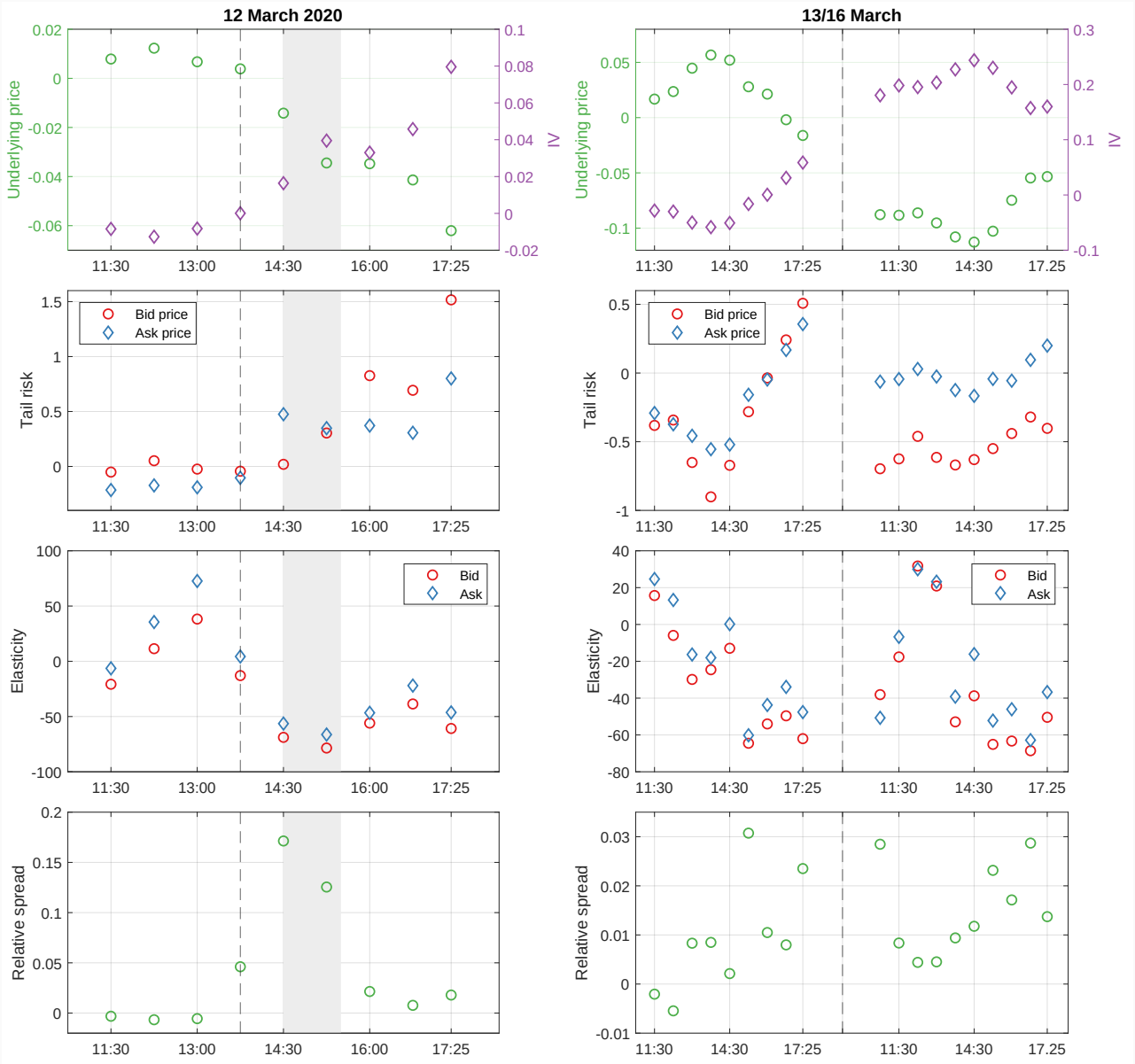
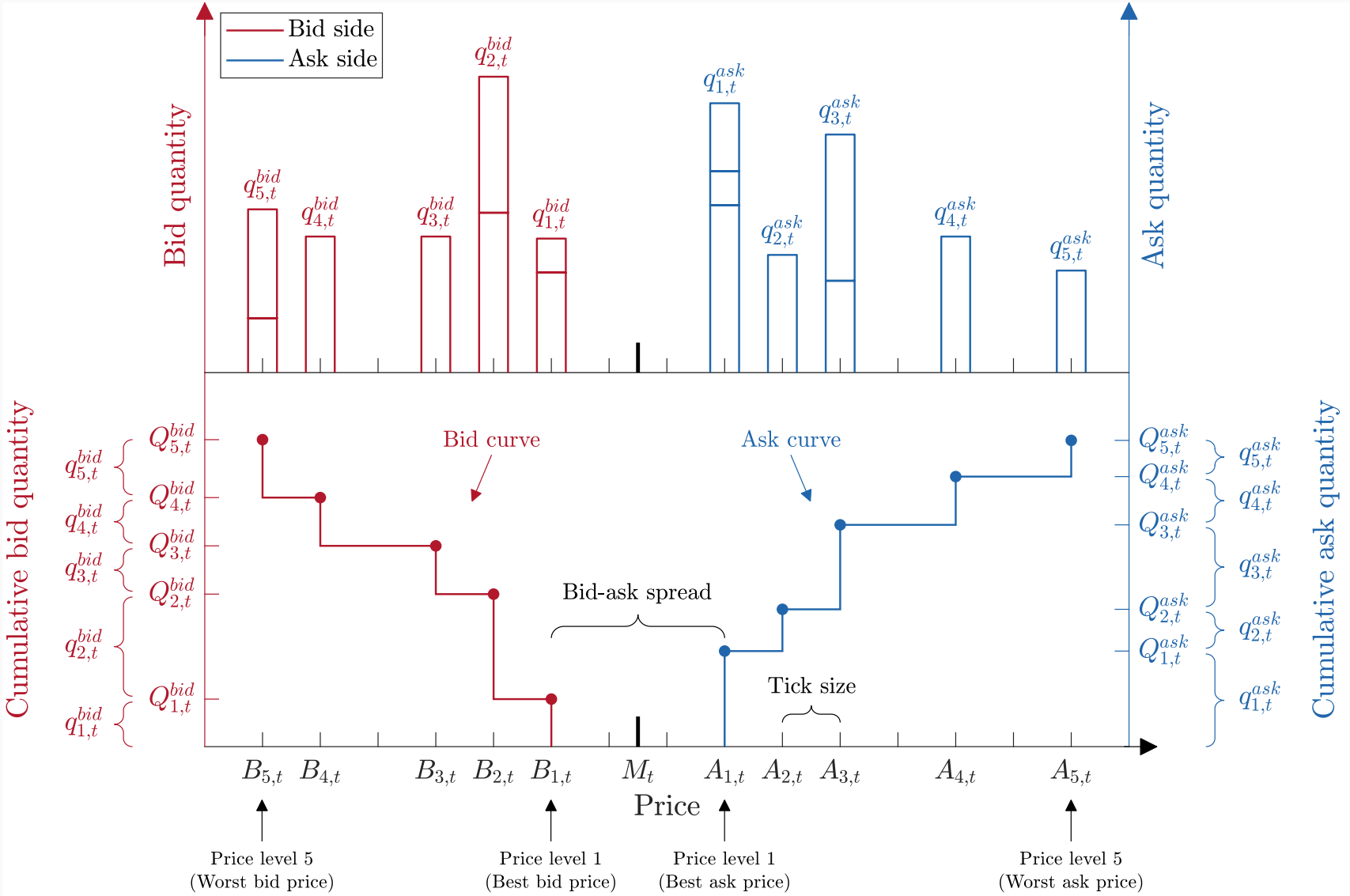


Illustration of an order book



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Effect on hedging costs through changes in volatility and liquidity

	IV		Relative spread	
Event date	Change in euro	Change in %	Change in euro	Change in %
March 12	8,765	12.54	415	1.05
March 13/16	22,341	27.58	0	0.00
March 18/19	553	0.66	−27	−0.06
March 18/20	−21,721	−25.79	−27	−0.06
March 23	−4,440	−6.91	96	0.25

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