

The Berlin Stock Exchange in the “Great Disorder”

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and

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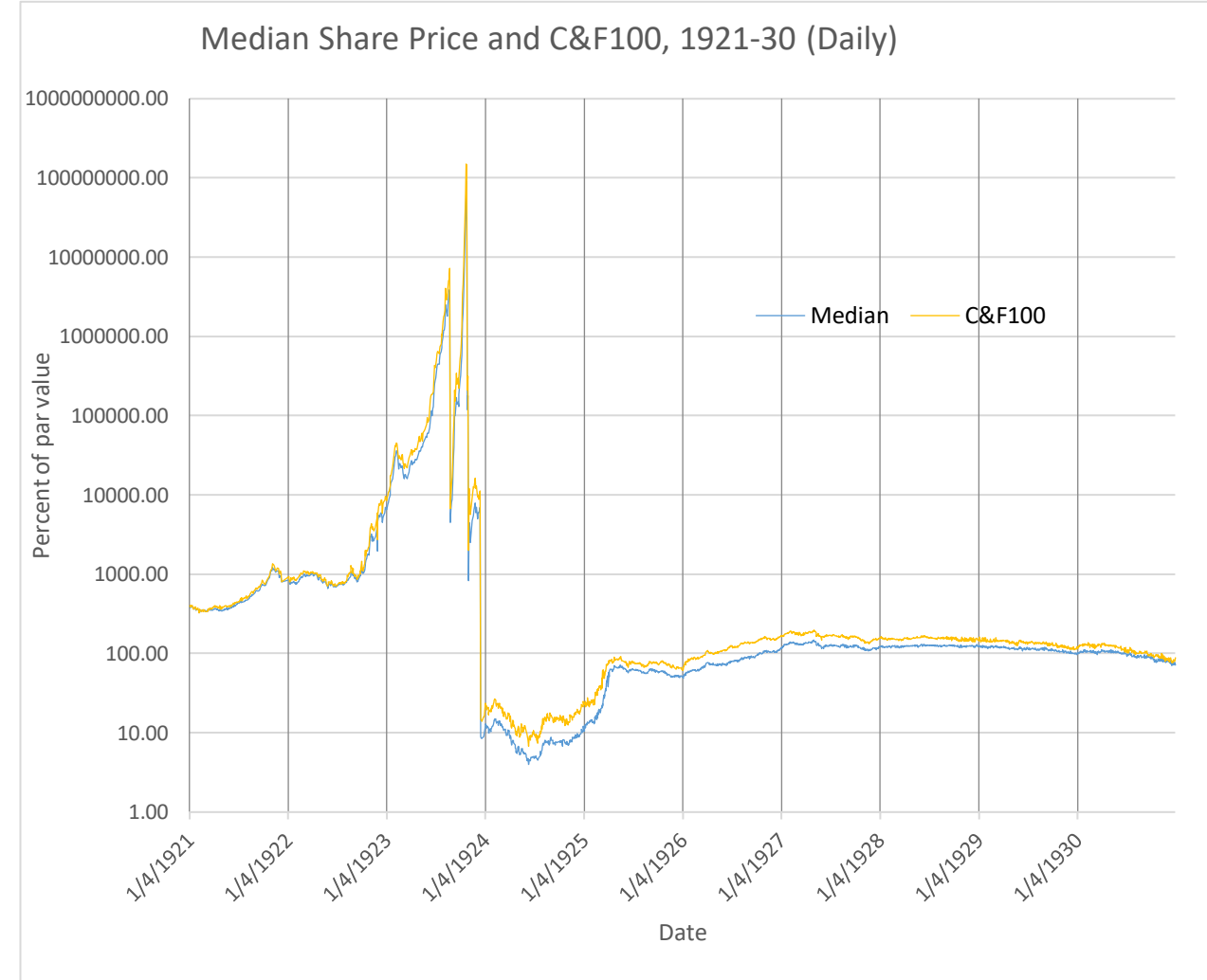
Plan for the talk

- **Background on “The Great Disorder”**
- **Microstructure of the Berlin Stock Exchange**
- **Data & Methods**
- **Results:**
 1. Market Activity
 2. Order Imbalance
 3. Direction of Trade—excess supply v. demand
 4. Volatility of returns
 5. Market illiquidity—Roll measure

“The Great Disorder”

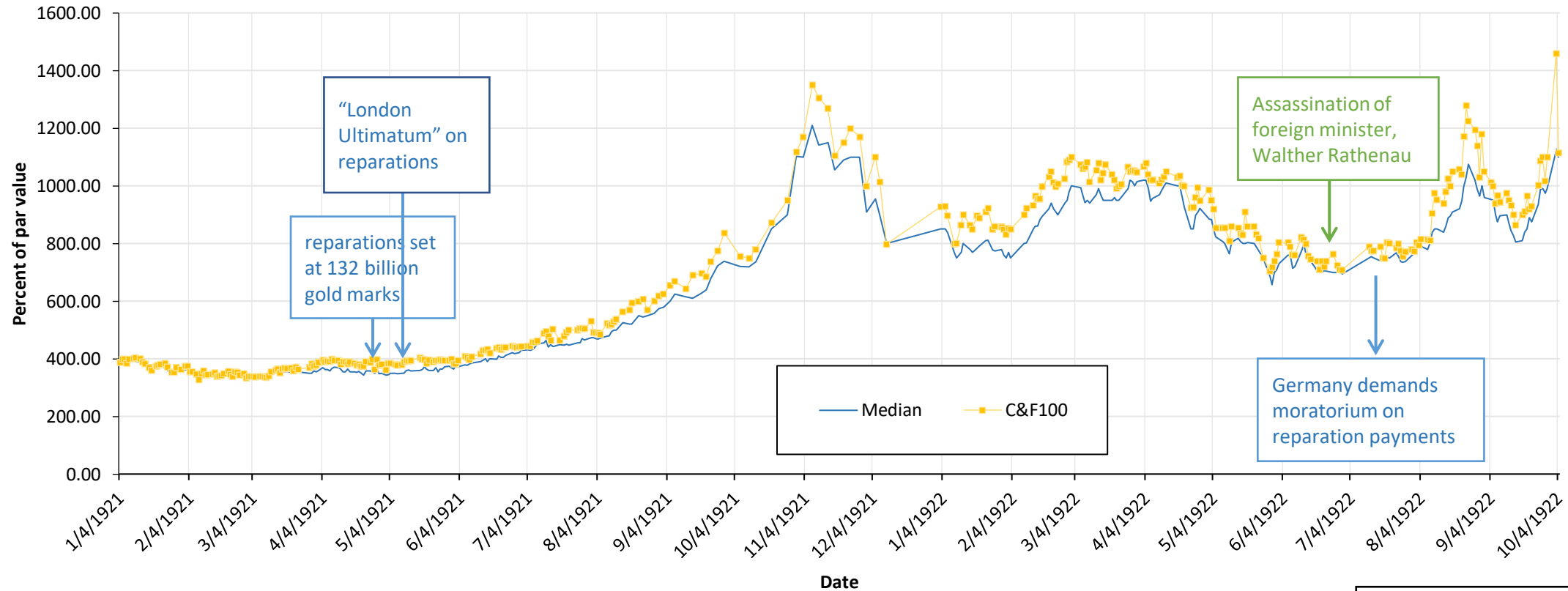
From the end of World War I to the Great Depression

- Political upheaval:
 - Abdication of Kaiser Wilhelm II
 - Founding of the Weimar Republic
 - Rise of the Nazi party
- Economic upheaval:
 - Massive war debt and reparations
 - Loss of productive capacity (and land)
- Monetary upheaval:
 - Hyperinflation and its end
 - Reichsbank policy regime changes
- Financial upheaval:
 - Boom in corporate foundations
 - 1927 stock market “bubble” and collapse (Black Friday, 13. May 1927)



Early 20's Run-up to Hyperinflation

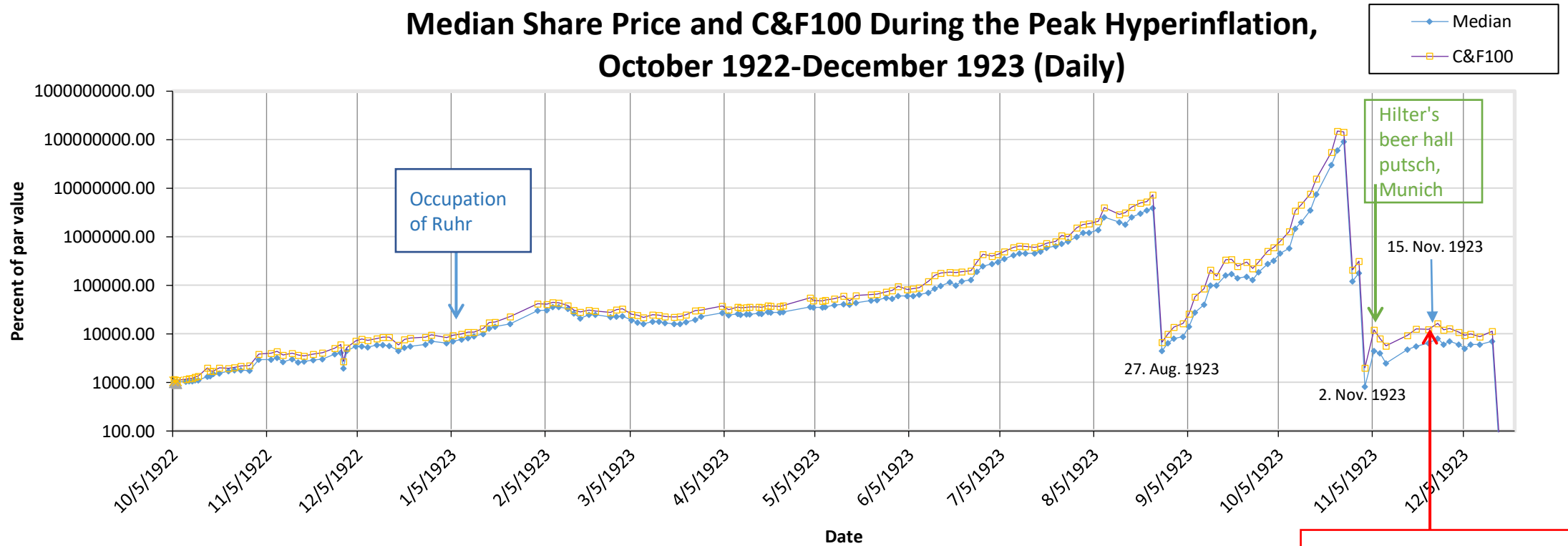
Median Share Price in the Early Stages of Inflation, 1921-22 (Daily)



Political Event
Economic/Reparations Event
Financial/Monetary Event

The Hyperinflation

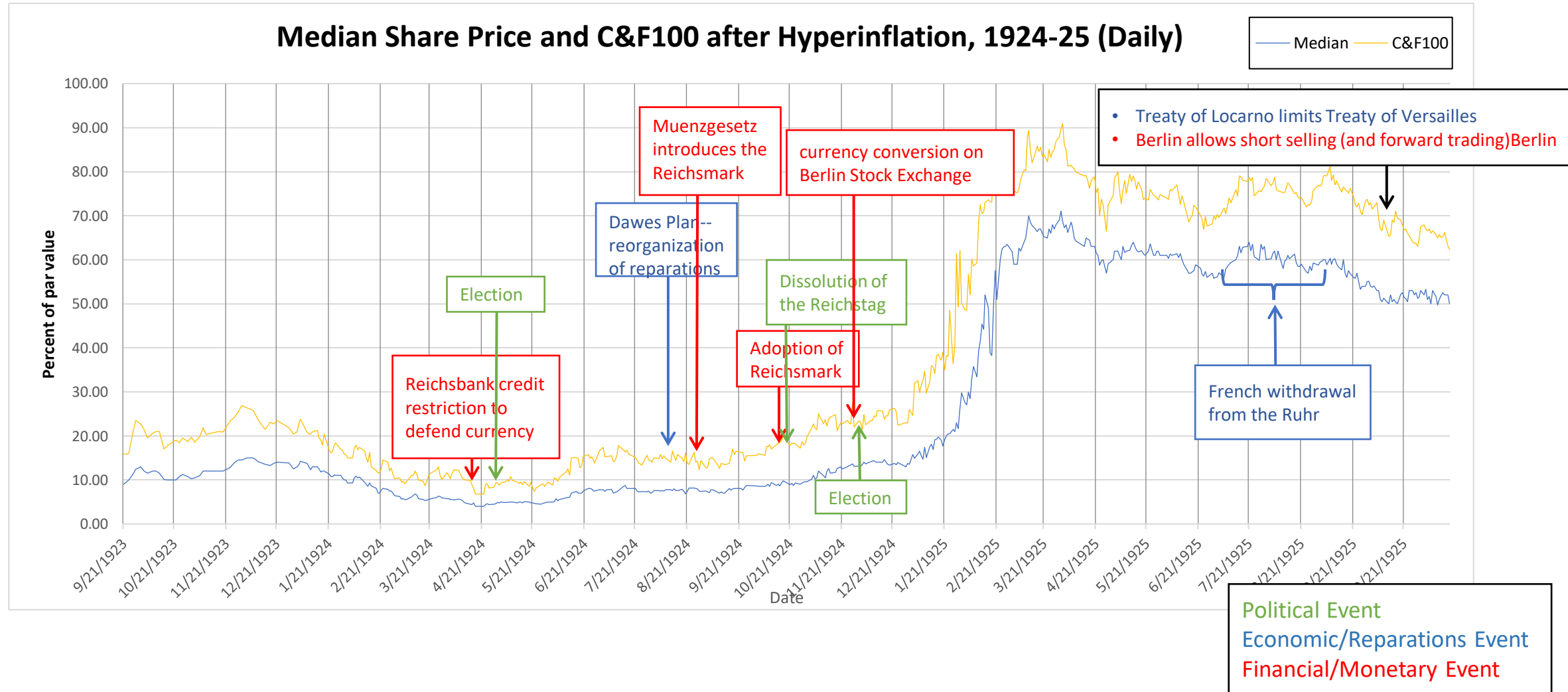
Median Share Price and C&F100 During the Peak Hyperinflation, October 1922-December 1923 (Daily)



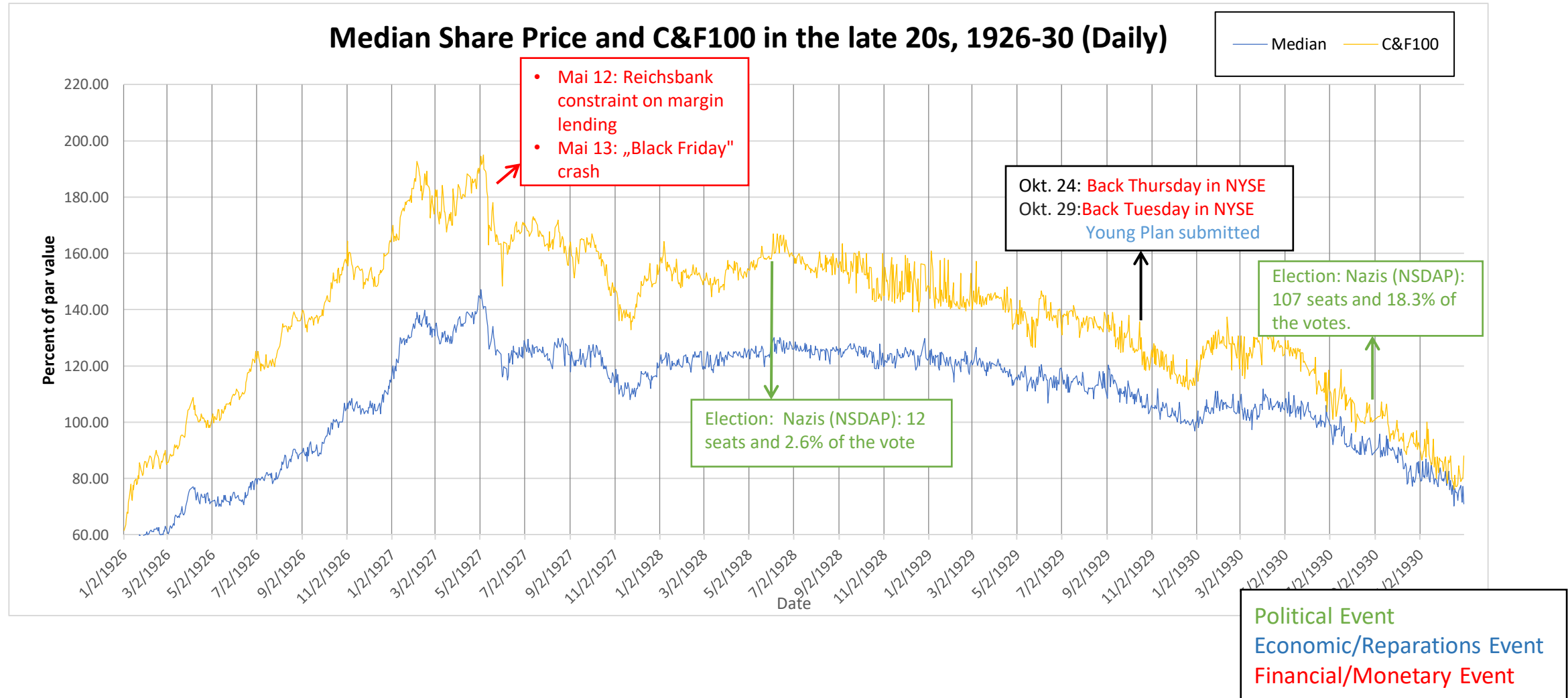
End of hyperinflation--
introduction of Rentenmark

Political Event
Economic/Reparations Event
Financial/Monetary Event

Mid 20's adjustment-revaluation period



Late 20's "Bubble"



Microstructure of the Berlin Stock Exchange in the 1920s

- Official market makers
- Call auction market for most shares
 - One market price per day
 - Standing quotation in case of order imbalance
 - No bid-ask spread
 - No trading volume recorded
- Several larger corporations with active markets did trade throughout the day

Data*

Use the "Kurszettel" from the Berliner Boersenzeitung

- Daily over 10 years - from January 1921 through December 1930

- Provides trading price or standing bid/ask quotation for all stocks with activity for a given day

- 2,505,953 observations
- 2,066,572 had a quoted price
- 1,544,901 were actual trades

- NB: we have collected but not yet analyzed the data for 1931-39

*Thanks to SAFE, University of Frankfurt for financial support for the data generation

Bank-Diskont		Amerikanische Eisenbahn-Bonds		Deutsche Staatsanleihen	
10. 10.	10. 10.	10. 10.	10. 10.	10. 10.	10. 10.
12.00	12.00	120.00	120.00	100.00	100.00
12.50	12.50	130.00	130.00	110.00	110.00
13.00	13.00	140.00	140.00	120.00	120.00

Aktien von Industriellen und Bergwerks-Gesellschaften.

Die Notierungen gelten für 1924, sofern die Gesellschaften nach dem 31. XII. 1923, aber vor dem 1. I. 1924 eingeleitet in andere Fälschen für 1923/24. Die Stücke der letzteren Aktien lassen über 1000 Mark. Abweichungen sind dem Nummernverzeichnis der B.Z. unter der Abkürzung des Gemeinheitsnamens der betreffenden Gesellschaft. Das mit einem * versehen Datum des letzten Rechnungsabrechens. Ein * ohne Angabe des Datums bedeutet das letzte Jahresabschluss für den 31. d. M. 1924. Die Aktien sind nach dem 31. d. M. 1924 in den amtlichen Verkehr kam. *) Das Stammkapital vermindert ist für die Kurszettel mitgeteilt. Ein * ohne die Angabe des Datums bedeutet, dass der Anstreich der Kapital- oder Verfalls-Aktive bis zum nächsten Jahresende stattgefunden hat. Stille Reserven sind in Billionen Mark für den Fortbestand der Kurse von Vorkurs.

W.B.	W.K.	W.B.	W.K.	W.B.	W.K.
1. 1. 1924	1. 1. 1924	1. 1. 1924	1. 1. 1924	1. 1. 1924	1. 1. 1924
10.00	10.00	20.00	20.00	30.00	30.00
40.00	40.00	50.00	50.00	60.00	60.00

Data

Indicates order imbalance

- **BZ** = "Bezahlt"
 - > trading happened
 - > market cleared
 - > **clearing price**

Indicates market direction

- **G** = GELD
 - > gesucht
 - > indicates excess buy orders
 - > excess demand
 - > **bid price**

- **B** = Brief
 - > angebote
 - > indicates excess sell orders
 - > excess supply
 - > **ask price**

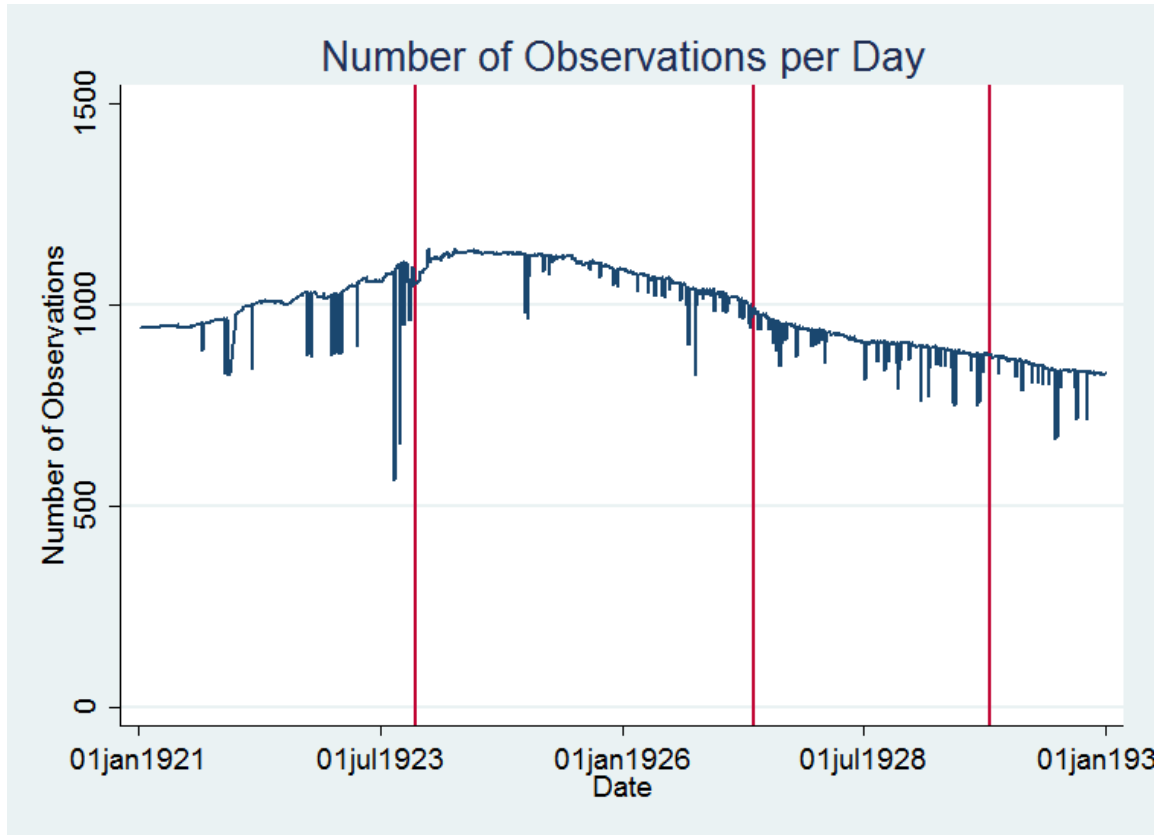
	Price	Trade information	Order Imbalance	Market Direction
88 bz	88	Bezahlt	Null	Neutral
93 bb	93	Bezahlt & Brief	Low	Excess Supply
95 bg	95	Bezahlt & Geld	Low	Excess Demand
98 etbb	98	etwas bezahlt & Brief	Medium	Excess Supply
101 etbg	101	etwas bezahlt & Geld	Medium	Excess Demand
104 B	104	Brief	High	Excess Supply
106 G	106	Geld	High	Excess Demand

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 4. **Volatility of returns**
 5. **Market illiquidity—Roll measure**

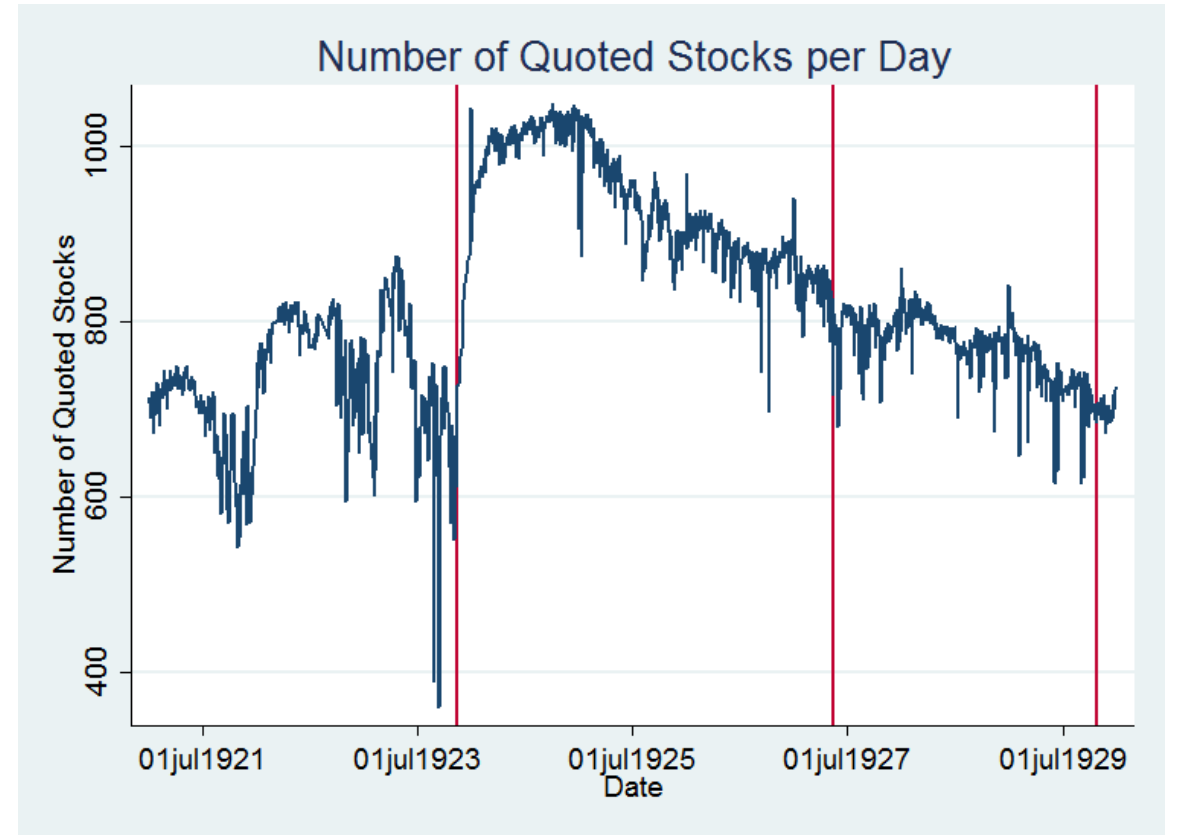
Market Size

- Total number of observed stocks each day



Market Volume

- Quoted stocks have either a market clearing transaction price or a standing quote (bid or ask)

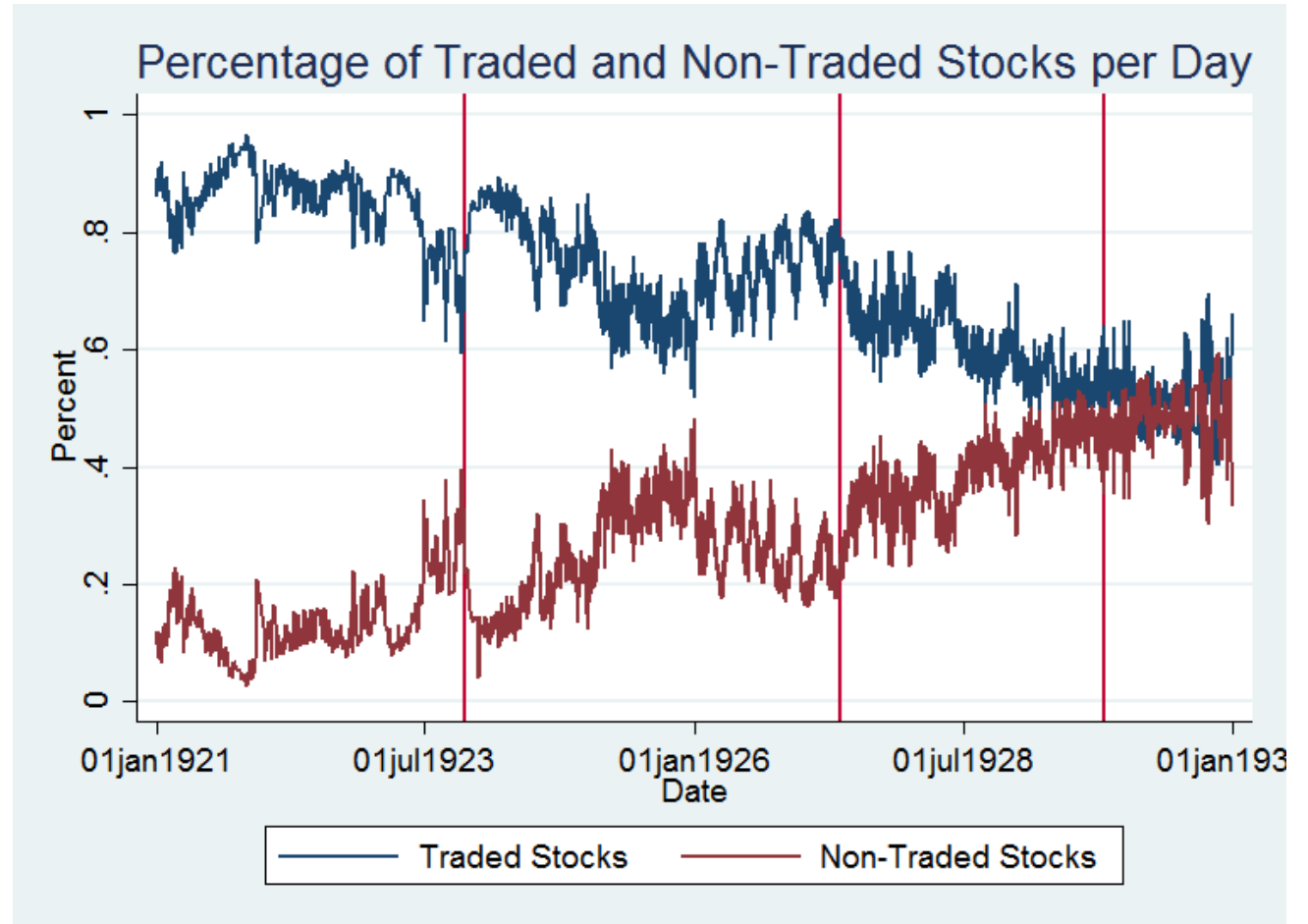


Order Imbalance

Listings give indication of trades or order imbalance

- “Bezahlt” indicates market clearing price
- G indicates excess buy orders, no trading
- B indicates excess sell orders, no trading

Computed in percent of total securities with observed prices or quotes for the given day.



Order Imbalance

Null – trading “Bezahlt”

= market cleared

Low – trading “Bezahlt” but there are shares remaining (buy or sell)

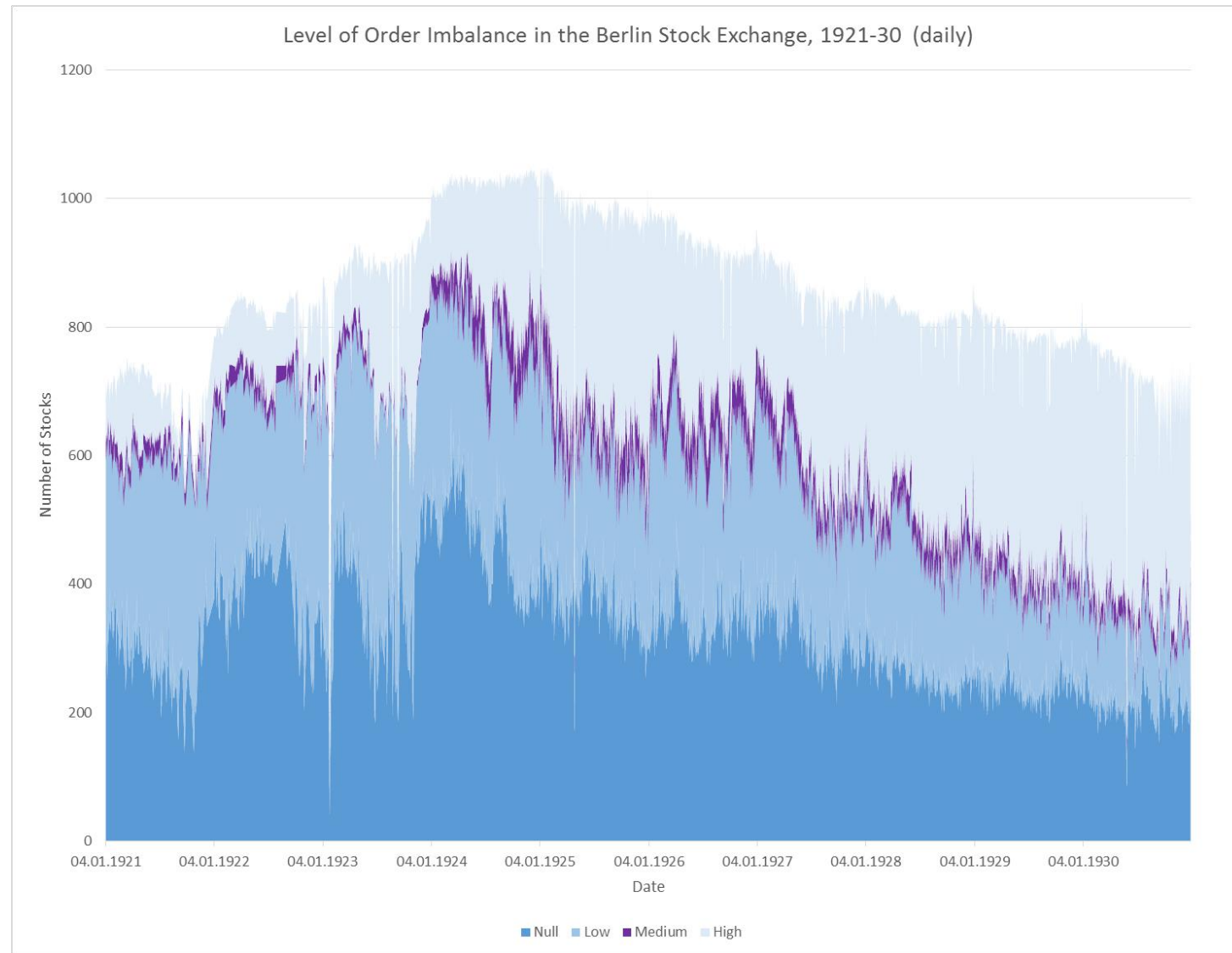
= market partially cleared but with some orders unfilled

Medium – low trading “Etwas Bezahlt”

= small amount cleared but significant orders remain unfilled

High – excess supply or excess demand

= no trading



Market Direction

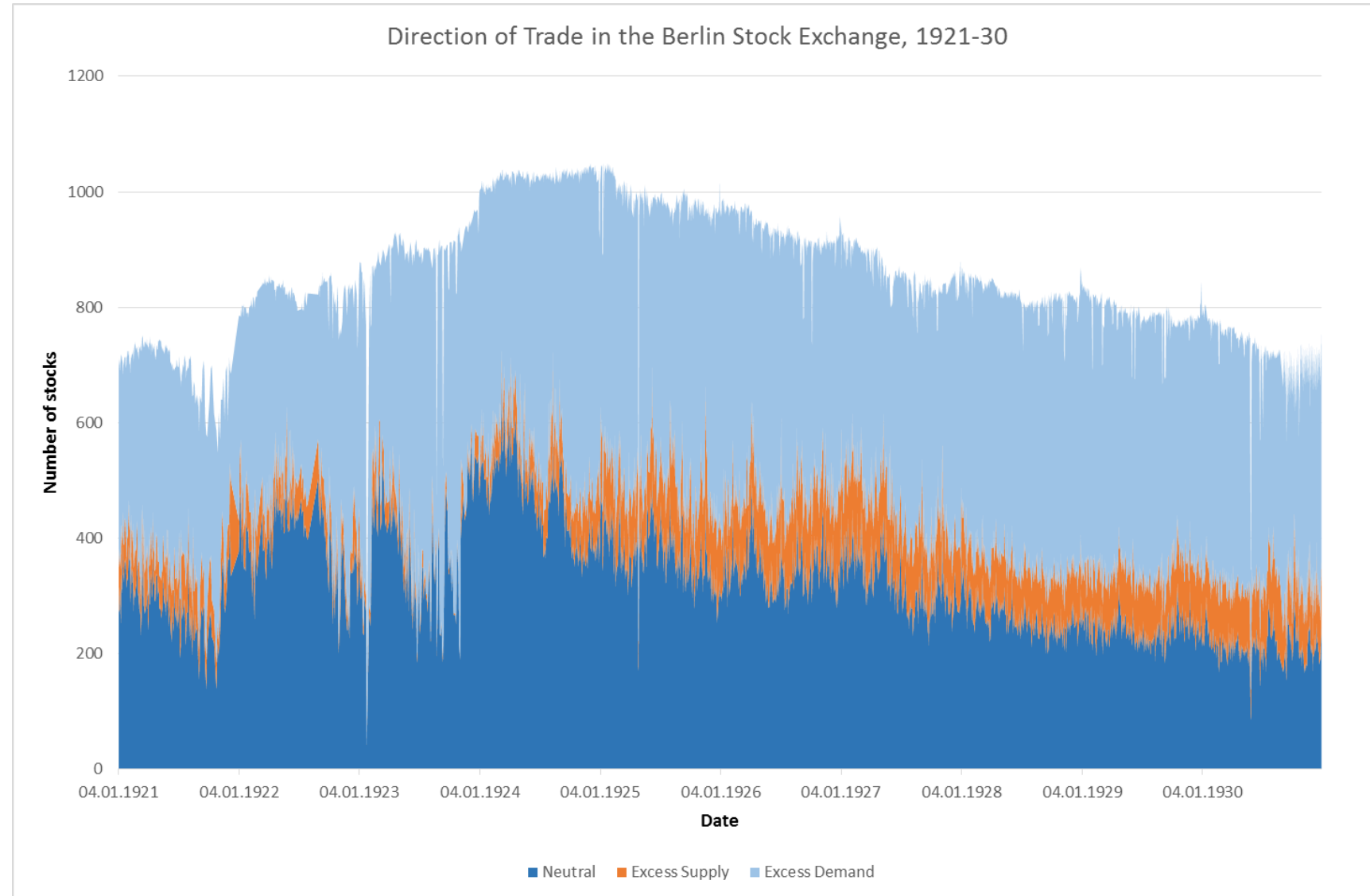
Excess Demand = excess buy orders “Geld”

Excess Supply = excess sell orders “Brief”

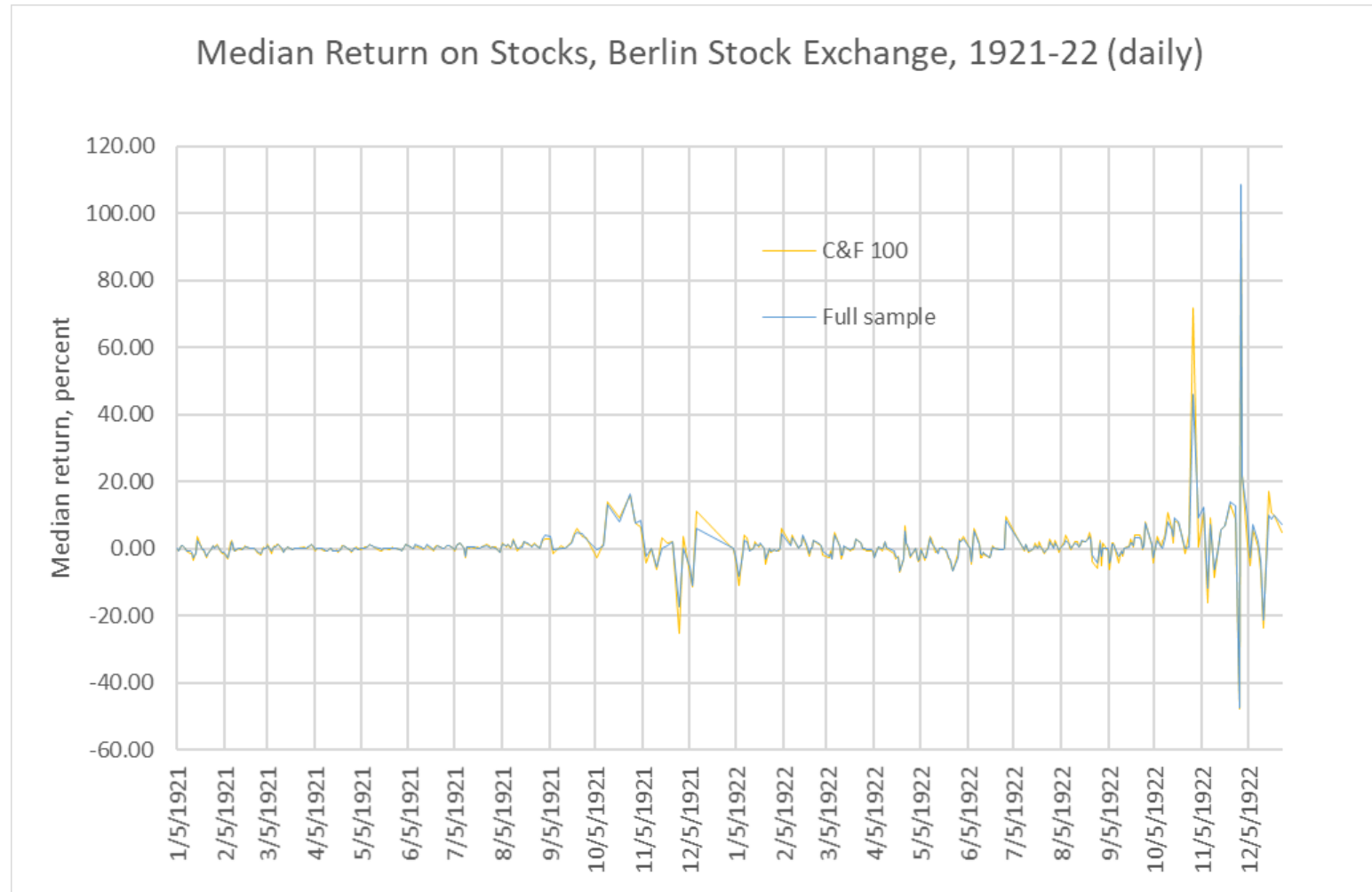
Neutral = market cleared

Demand exceeded supply most days

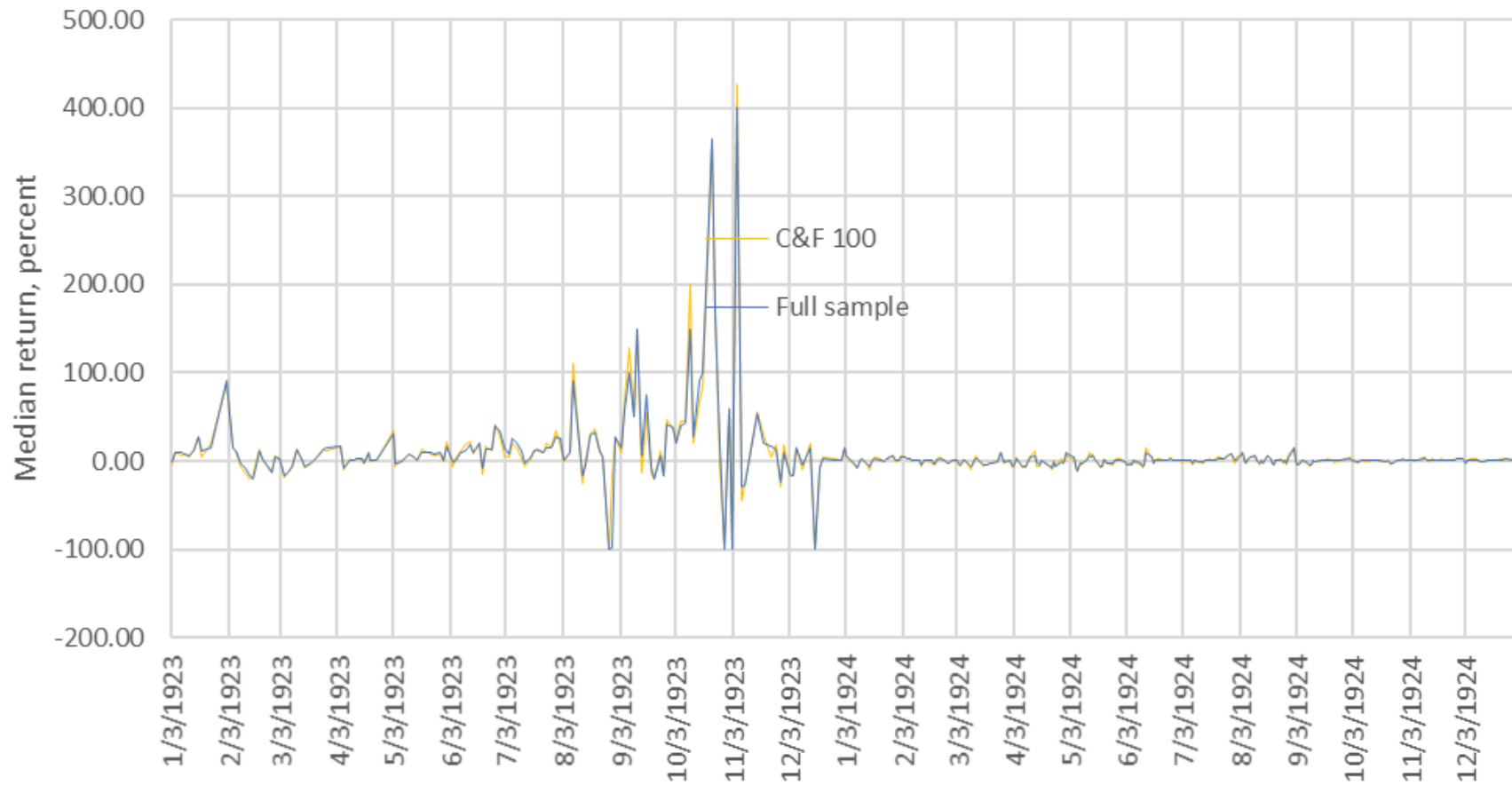
Especially strong during end of hyperinflation



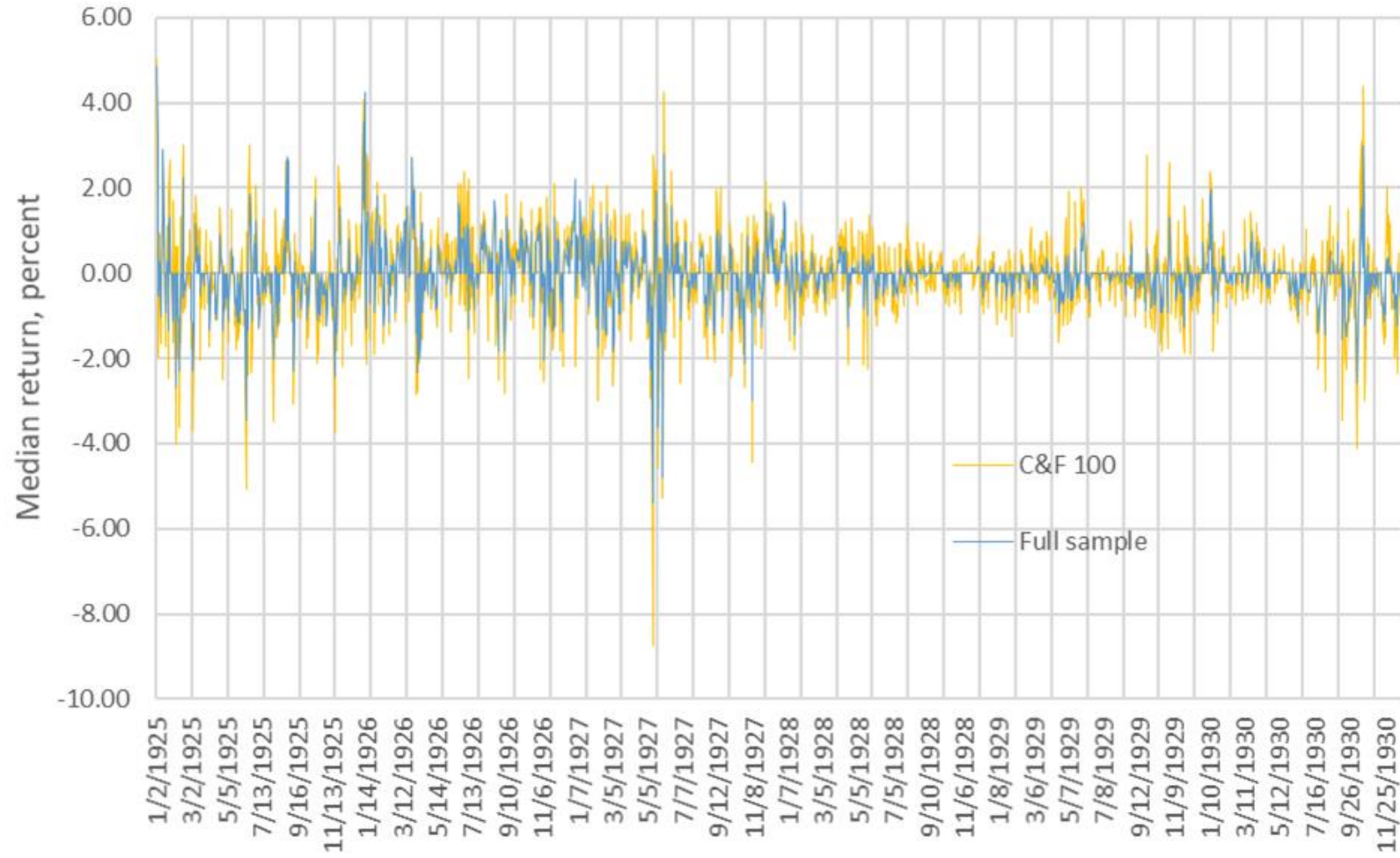
Daily stock returns



Median Return on Stocks in the Berlin Stock Exchange, 1923-24 (daily)



Median Return on Stocks, Berlin Stock Exchange, 1925-30 (daily)

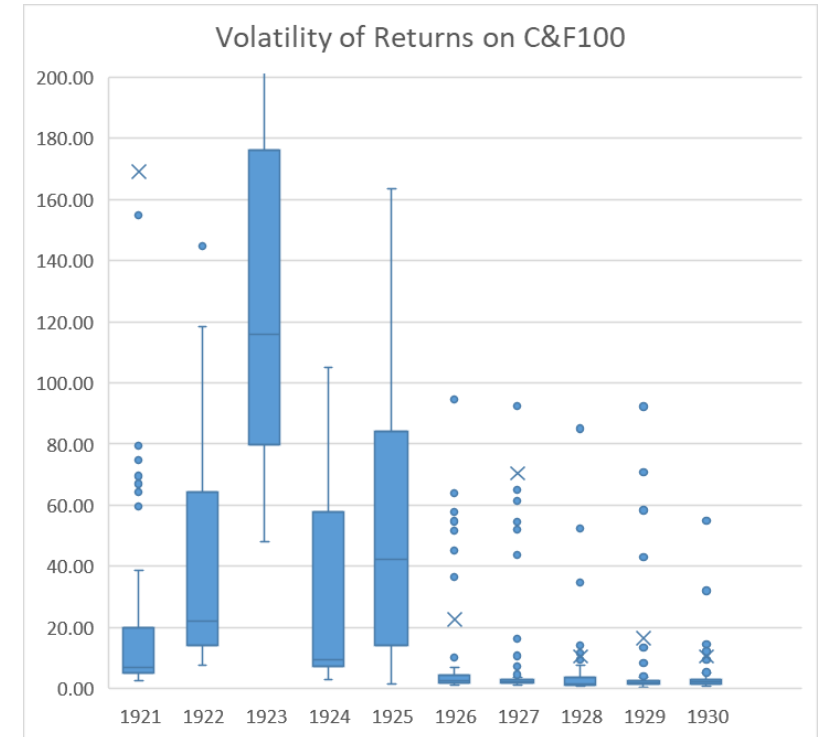
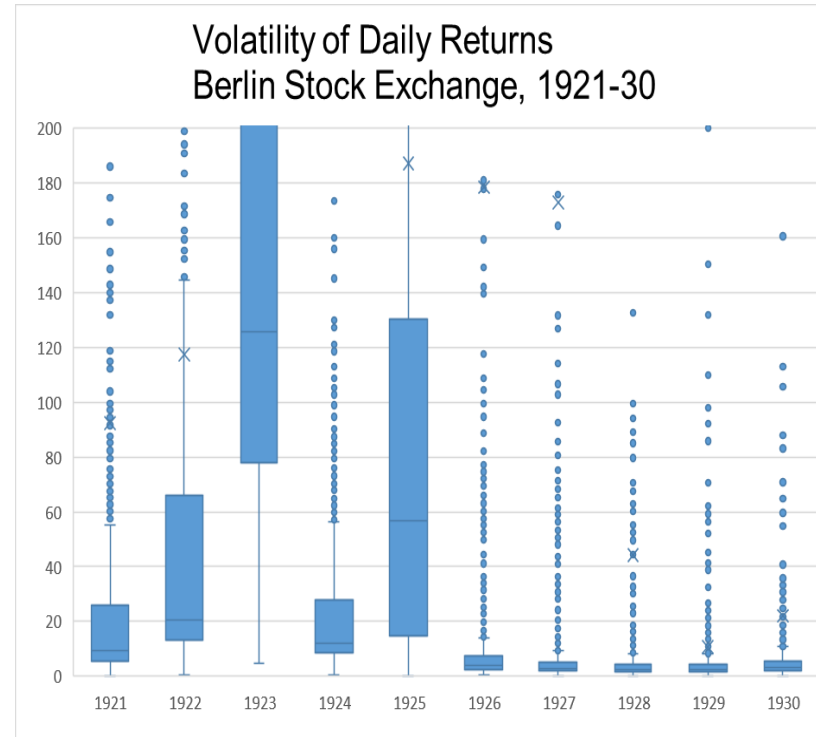


Volatility of Returns

Computed as standard deviation of daily returns for all stocks with a transaction price.

Truncated hyperinflation outliers in order to visualize other years.

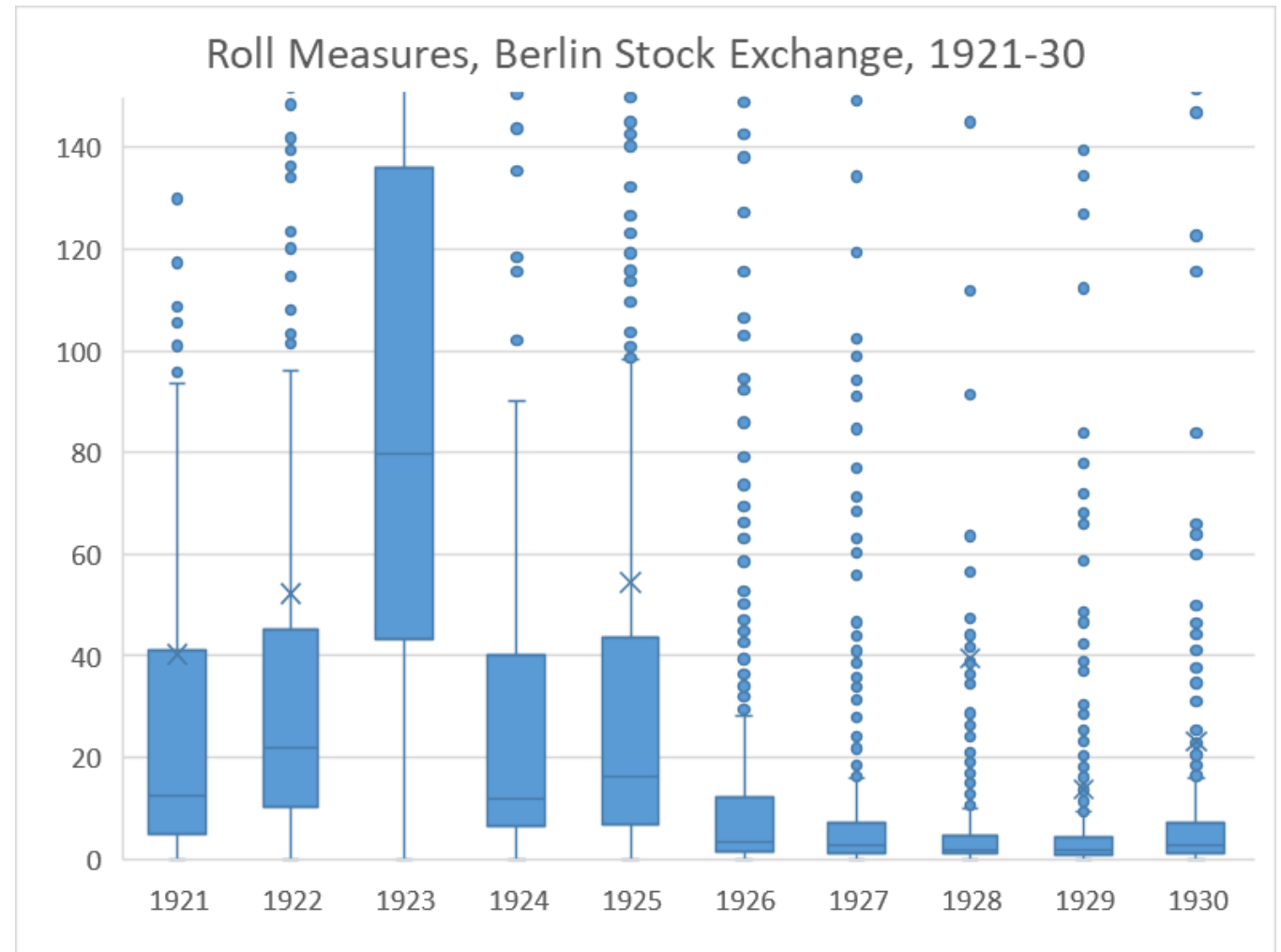
Volatility is lower for the C&F100 stocks compared to the full sample.



Market Liquidity

Distribution of Roll measures by stock

- Roll measure estimates bid-ask spread solely from transaction prices.
- Excludes cases of negative autocovariance
- Graph excludes extreme outliers (top 5 percent)
- Roll measures are lower for the C&F100 stocks compared to the full sample.
- Gehrig and Fohlin (2006): Same market under vastly different conditions -> much lower Roll measures



Cross Section of Illiquidity

Stocks characteristics relating to illiquidity (Roll measure)

- Pooled annual cross sections 1921-30
- Quantile regression with standard errors clustered on stock
- Share capital available (so far) for 75% of stocks.
- Results confirm Microstructure Theories
- Surprising “New Company”

=> Functioning Market with high Volatility and Spread

VARIABLES	Quantile	Quantile - Sample	Quantile 25%	Quantile	Quantile 75%
	with annual controls				
Median Price	0.00042 (0.000365)	0.0005*** (0.000135)	5.98e-05*** (8.45e-06)	6.91e-05 (0.000200)	8.75e-05 (0.000198)
Volatility of Returns	0.186 (0.128)	0.204*** (0.000546)	0.153*** (9.25e-05)	0.183*** (0.00133)	0.354*** (0.00216)
Traded	-0.030*** (0.01)	-0.032*** (0.003)	-0.00594 (0.004)	-0.0129*** (0.001)	-0.0321 (0.090)
New Company	-2.297** (0.948)	-1.332*** (0.383)	-0.120 (0.751)	-0.0738 (0.158)	-0.305 (17.59)
Capital		-3.28e-07*** (3.89e-08)			
Constant	10.39*** (3.371)	10.39*** (0.721)	12.16*** (0.941)	5.252*** (1.035)	24.63 (24.24)
Observations	7,058	5,259	7,058	7,058	7,058
R-squared	0.495	0.495		0.493	

Conclusions

- First ever comprehensive daily stock price series for Germany 1920's
 - Berlin stock exchange during the Great Disorder was a functioning market, though with high volatility and high spreads
 - Stocks spreads have a positive relationship with price and return volatility and a negative relationship with the number of trades and the amount of capital. Surprisingly, new companies do not seem to incur additional illiquidity.
- First paper on the German stock market using information on the trades
 - Market direction: demand exceeded supply, especially during the end of the hyperinflation.
 - Market imbalance:
 - Did not significantly affect the early 1920's nor the hyperinflation
 - the late 1920's "bubble" and crash experienced a high market imbalance and is even stronger for the 100 most traded stocks (C&F 100).