The Berlin Stock Exchange in the “Great Disorder”

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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)

- "London Ultimatum" on reparations
- Reparations set at 132 billion gold marks
- Assassination of foreign minister, Walther Rathenau
- Germany demands moratorium on reparation payments

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)

- Occupation of Ruhr
- Hitler’s beer hall putsch, Munich
- 15. Nov. 1923
- 27. Aug. 1923
- 2. Nov. 1923
- End of hyperinflation--introduction of Rentenmark

Political Event
Economic/Reparations Event
Financial/Monetary Event
Mid 20’s adjustment-revaluation period

Median Share Price and C&F100 after Hyperinflation, 1924-25 (Daily)

- Reichsmark introduction
- Muenzgesetz introduces the Reichsmark
- Reichsbank credit restriction to defend currency
- Dawes Plan—reorganization of reparations
- Election
- Dissolution of the Reichstag
- Adoption of Reichsmark
- Currency conversion on Berlin Stock Exchange
- French withdrawal from the Ruhr
- Treaty of Locarno limits Treaty of Versailles
- Berlin allows short selling (and forward trading)

Political Event
Economic/Reparations Event
Financial/Monetary Event
Late 20’s “Bubble”

Median Share Price and C&F100 in the late 20s, 1926-30 (Daily)

- Mai 12: Reichsbank constraint on margin lending
- Mai 13: “Black Friday” crash
- Okt. 24: Back Thursday in NYSE
- Okt. 29: Back Tuesday in NYSE
- Young Plan submitted

Election: Nazis (NSDAP): 12 seats and 2.6% of the vote.
Election: Nazis (NSDAP): 107 seats and 18.3% of the votes.
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 gathering
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

<table>
<thead>
<tr>
<th>Price</th>
<th>Trade information</th>
<th>Order Imbalance</th>
<th>Market Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>88</td>
<td>Bezahlt</td>
<td>Null</td>
<td>Neutral</td>
</tr>
<tr>
<td>93</td>
<td>Bezahlt &amp; Brief</td>
<td>Low</td>
<td>Excess Supply</td>
</tr>
<tr>
<td>95</td>
<td>Bezahlt &amp; Geld</td>
<td>Low</td>
<td>Excess Demand</td>
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<tr>
<td>98</td>
<td>etwas bezahlt &amp; Brief</td>
<td>Medium</td>
<td>Excess Supply</td>
</tr>
<tr>
<td>101</td>
<td>etwas bezahlt &amp; Geld</td>
<td>Medium</td>
<td>Excess Demand</td>
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<tr>
<td>104</td>
<td>Brief</td>
<td>High</td>
<td>Excess Supply</td>
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<tr>
<td>106</td>
<td>Geld</td>
<td>High</td>
<td>Excess Demand</td>
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</table>
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  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, Berlin Stock Exchange, 1921-22 (daily)

[Graph showing median stock returns with two lines, one for C&F 100 and another for Full sample. The graph indicates variability in returns over time.]
Median Return on Stocks in the Berlin Stock Exchange, 1923-24 (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

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Quantile Sample</th>
<th>Quantile 25%</th>
<th>Quantile 50%</th>
<th>Quantile 75%</th>
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<tbody>
<tr>
<td>Median Price</td>
<td>0.00042</td>
<td>0.0005***</td>
<td>5.98e-05***</td>
<td>6.91e-05</td>
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<tr>
<td></td>
<td>(0.000365)</td>
<td>(0.000135)</td>
<td>(8.45e-06)</td>
<td>(0.000200)</td>
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<td>Volatility of Returns</td>
<td>0.186</td>
<td>0.204***</td>
<td>0.153***</td>
<td>0.183***</td>
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<td>(0.128)</td>
<td>(0.000546)</td>
<td>(9.25e-05)</td>
<td>(0.00133)</td>
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<tr>
<td>Traded</td>
<td>-0.030***</td>
<td>-0.032***</td>
<td>-0.00594</td>
<td>-0.0129***</td>
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<td></td>
<td>(0.01)</td>
<td>(0.003)</td>
<td>(0.004)</td>
<td>(0.001)</td>
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<tr>
<td>New Company</td>
<td>-2.297**</td>
<td>-1.332***</td>
<td>-0.120</td>
<td>-0.0738</td>
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<td>(0.948)</td>
<td>(0.383)</td>
<td>(0.751)</td>
<td>(0.158)</td>
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<td>Capital</td>
<td>-3.28e-07***</td>
<td>-3.89e-08</td>
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<tr>
<td>Constant</td>
<td>10.39***</td>
<td>10.39***</td>
<td>12.16***</td>
<td>5.252***</td>
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<td>(3.371)</td>
<td>(0.721)</td>
<td>(0.941)</td>
<td>(1.035)</td>
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<tr>
<td>Observations</td>
<td>7,058</td>
<td>5,259</td>
<td>7,058</td>
<td>7,058</td>
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<tr>
<td>R-squared</td>
<td>0.495</td>
<td>0.495</td>
<td>0.493</td>
<td></td>
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</tbody>
</table>
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).