Liquidity in Markets and its Impacts during Recession

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Outline

• Liquidity in physical systems
• Motivation
• Liquidity in markets (good or bad?)
• Conclusion
Free volume idea
Caging effects in molecular systems

Mean square displacement decreases with decreasing temperature. Caging effects become more apparent at low temperature.

\[ \langle u^2 \rangle = \langle r^2(t_{cage}) \rangle \]

Hanakata et al. Nature Communications 5, 5166 (2014)

Dow Jones Industrial Stock Index

A drop of 25% in less than a year

If prices can only change when trades are made, can volume tell us about the market?

Figure is taken from http://www.macrotrends.net/1319/dow-jones-100-year-historical-chart
Data Sets

• Data: Daily volume data (~6000 companies with a total of ~500,000,000 stocks traded)
• Source: BATS stock exchange
• Time frame: July 2007–December 2008
Log-normal distribution of stocks volume

\[ N(\ln x; \mu, \sigma) = \frac{1}{\sigma \sqrt{2\pi}} \exp \left[ -\frac{(\ln x - \mu)^2}{2\sigma^2} \right], \quad x > 0. \]

\`Mobile\' companies have stocks that are traded very frequently in each given day.
Defining liquidity in market

\[ E[X] = e^{\mu + \frac{1}{2} \sigma^2}, \]
\[ E[X^2] = e^{2\mu + 2\sigma^2}, \]
\[ \text{Var}[X] = E[X^2] - E[X]^2 = (E[X])^2(e^{\sigma^2} - 1) = e^{2\mu + \sigma^2}(e^{\sigma^2} - 1), \]
\[ \text{SD}[X] = \sqrt{\text{Var}[X]} = e^{\mu + \frac{1}{2} \sigma^2} \sqrt{e^{\sigma^2} - 1} = E[X] \sqrt{e^{\sigma^2} - 1}, \]

\[ \mu = \ln \left( \frac{E[X]^2}{\sqrt{E[X^2]}} \right) = \ln \left( \frac{E[X]^2}{\sqrt{\text{Var}[X] + E[X]^2}} \right), \]
\[ \sigma^2 = \ln \left( \frac{E[X^2]}{E[X]^2} \right) = \ln \left( 1 + \frac{\text{Var}[X]}{E[X]^2} \right). \]

Define liquidity as \[ \text{CV}[X] = \sqrt{e^{\sigma^2} - 1}. \] or \[ \mu \]
Liquidity during 2008 recession

Slight increase in the average number of stocks traded per day

Clear increase in the width of stocks distribution traded per day
Discussion

• Increasing money supply should increase price
• Increasing money supply would create liquidity in the market
• High liquidity during unstable economy leads to a significant fall in price
Conclusion

• A method to quantify liquidity in markets was developed
• High liquidity during unstable economy leads to a significant fall in price
• Keeping inflation below 2% is not enough, policy makers need to introduce a new policy to keep liquidity below some values
• Monetary easing might worsen the economy if it is not regulated properly
Thank you for listening

When the Recession Comes, We Can Always Drop Money Out of Helicopters

Ben Bernanke's much-mocked defense of showering cash down on nervous Americans is enjoying a little renaissance.

Yes, BUT....