

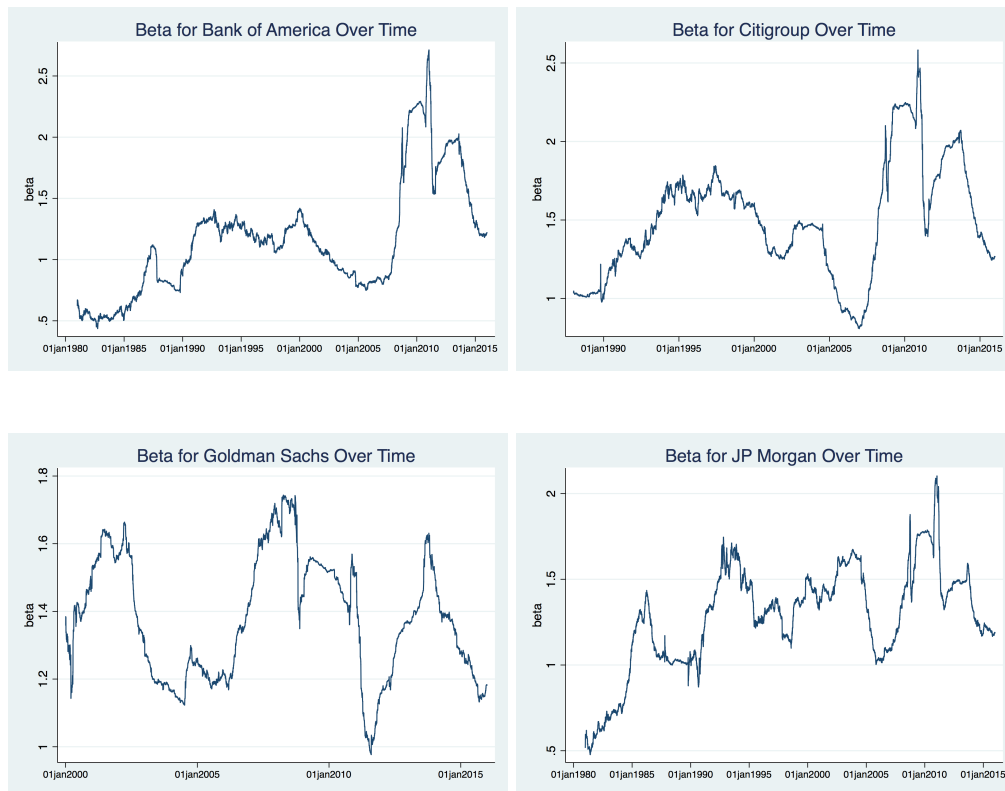
# Understanding Long-Term Bank Trends

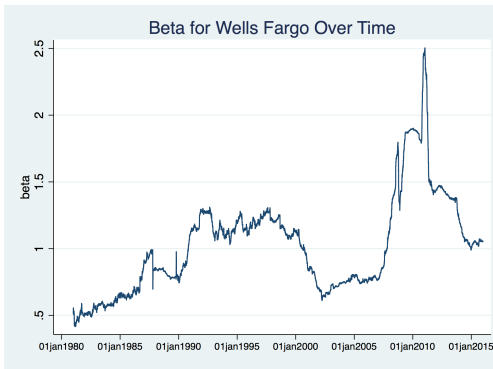
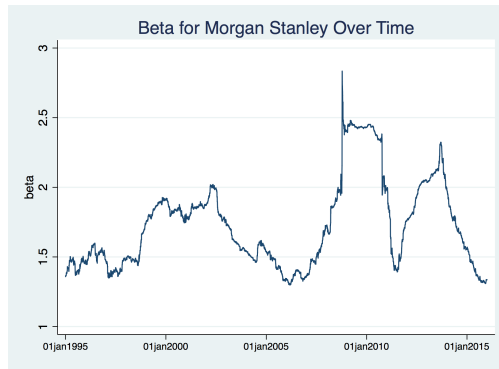
October 5, 2016

## 1 Historical Beta and Volatility

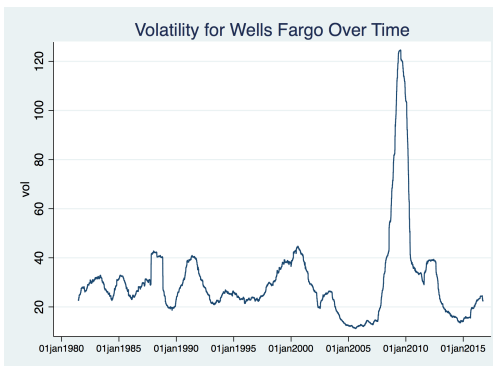
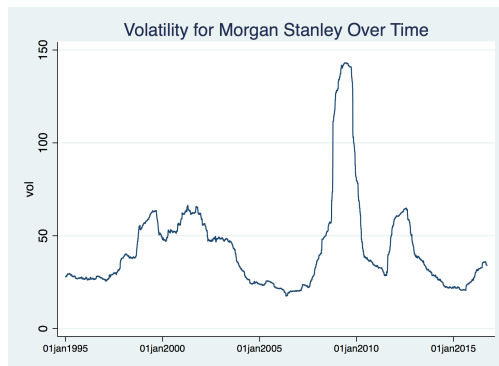
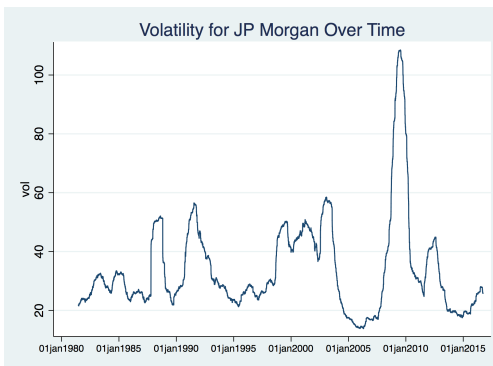
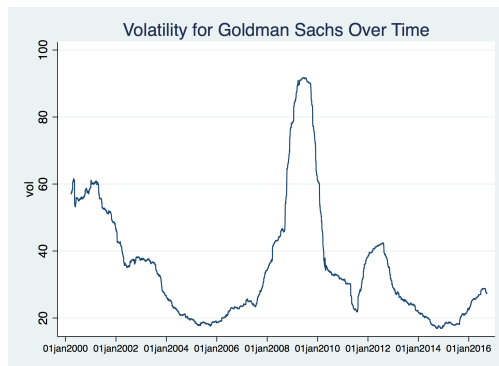
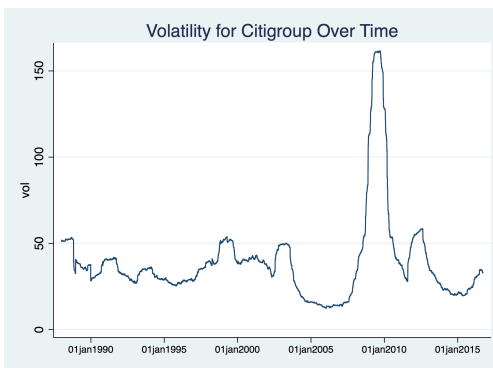
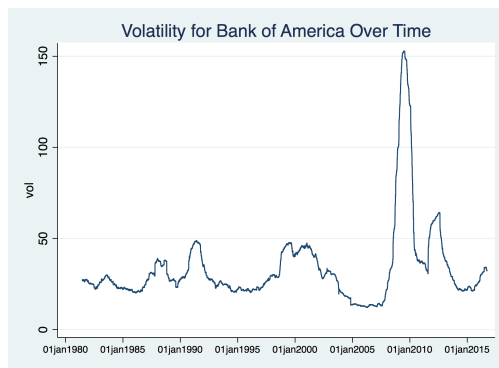
We pulled data on betas for our firms as far back as they existed. We traced the Big 6 by their permanent identifier (“permno”) which means that in many cases we pull betas and volatility for predecessors (i.e. Chemical Bank, then Chase Manhattan, then JP Morgan Chase) dating back to 1980. We present the results for each bank in the charts below.

### 1.1 Beta





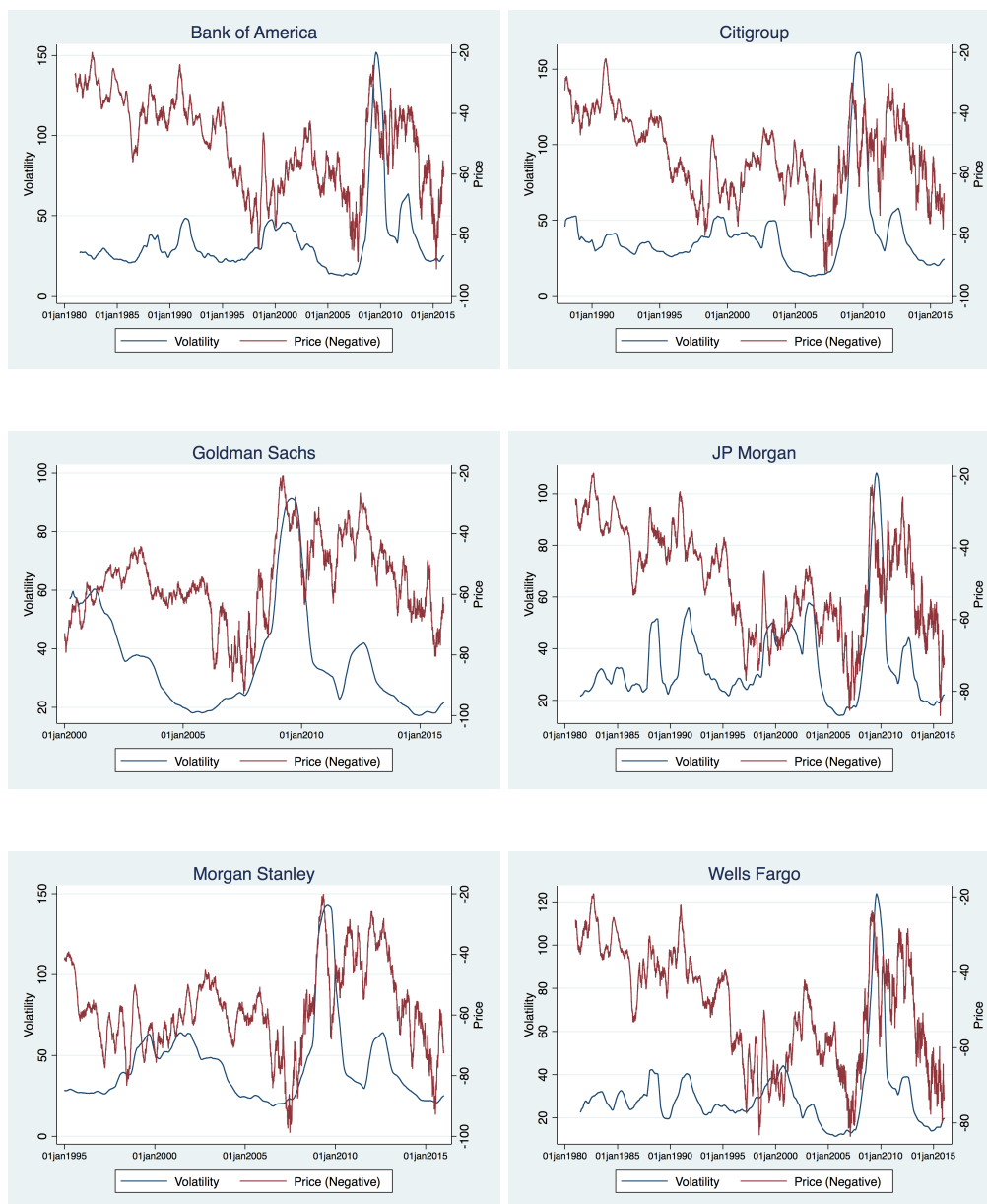
## 1.2 Volatility



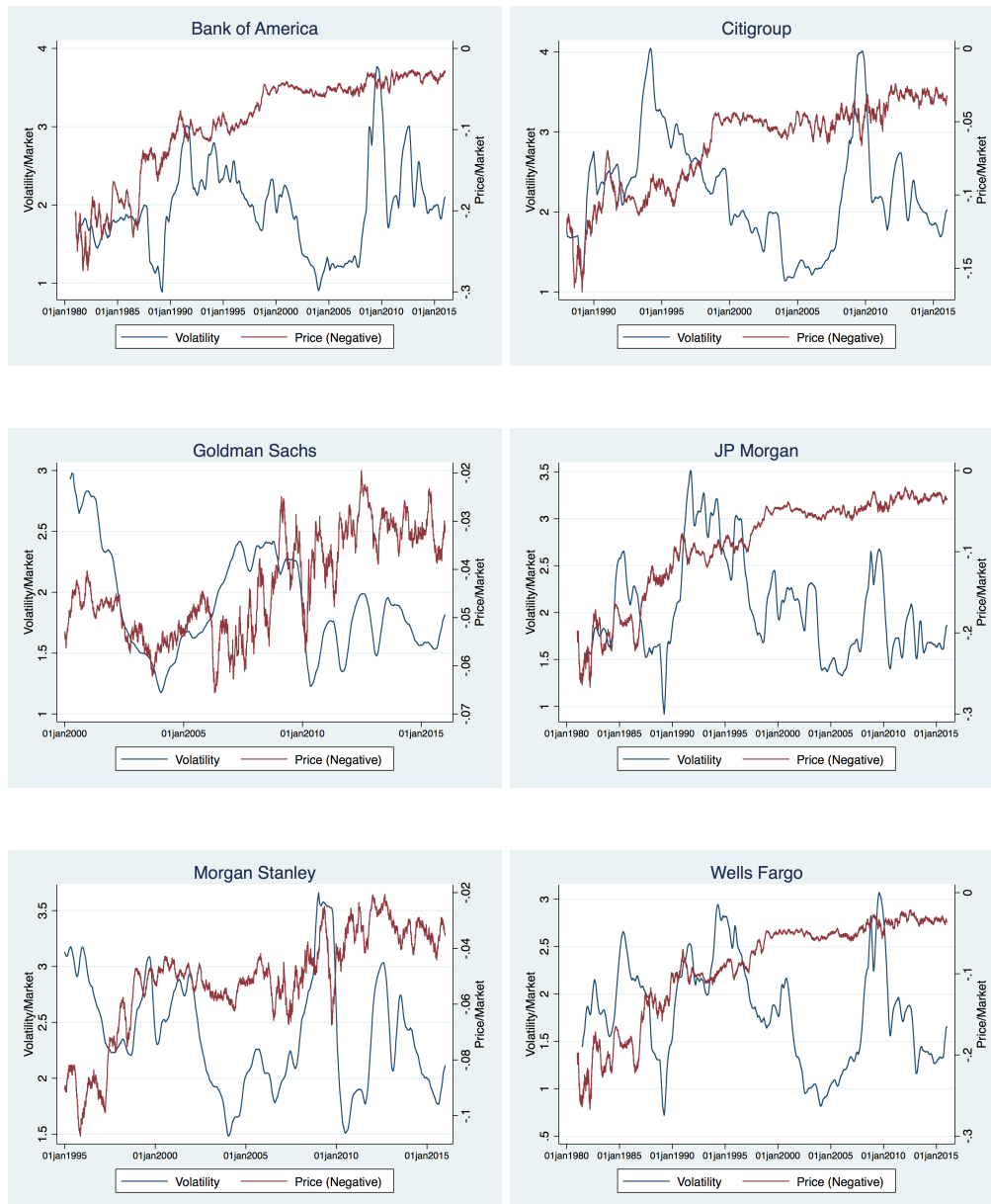
## 2 Correlations between level of bank stock prices and volatility

To give us a sense of the relationship between price and volatility, we plot the three-month moving average volatility and three-month moving average price for each of our Big 6 banks. We then present these same plots again, but this time, adjusting for the market. To adjust for the market, we divide stock price by the S&P 500 index price and similarly divide volatility by the volatility of the S&P 500.

### 2.1 Bank stock price and volatility

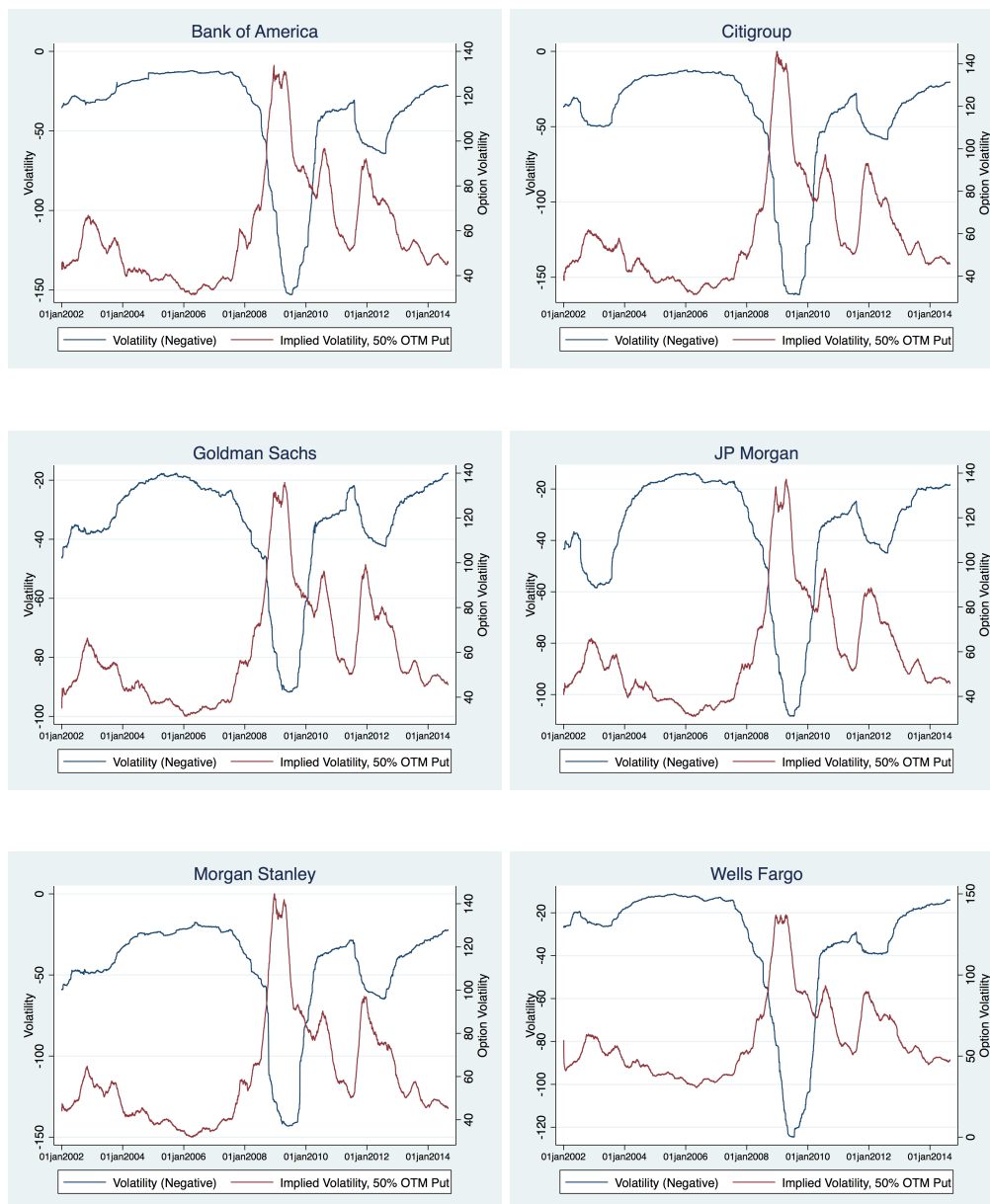


## 2.2 Bank stock price and volatility, relative to market



### 3 Bank OTM Put Volatility versus Historical Volatility Measure

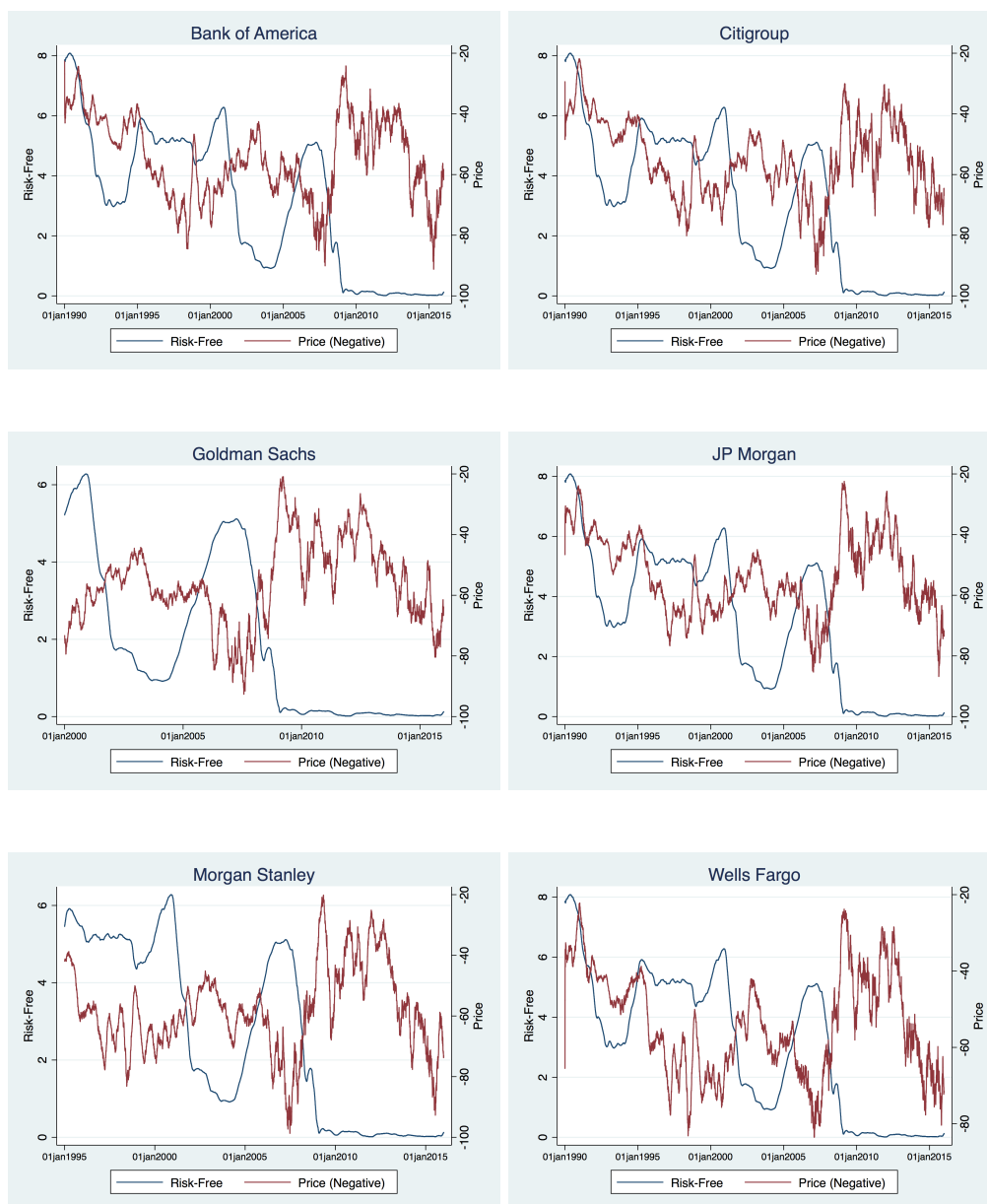
We also wanted to compare the OTM put implied volatility we used in our option delta calculations to the historical measure we use for the tables we present in the paper. I have done this below. This put option volatility is the implied volatility on the option that is closest to 50% out of the money on each day in our sample period. We again present three-month moving averages. Note that I benchmarked against historical volatility (rather than implied volatility) because our implied volatility data only goes back to 2005. We can easily do a version of this with implied volatility if you prefer.



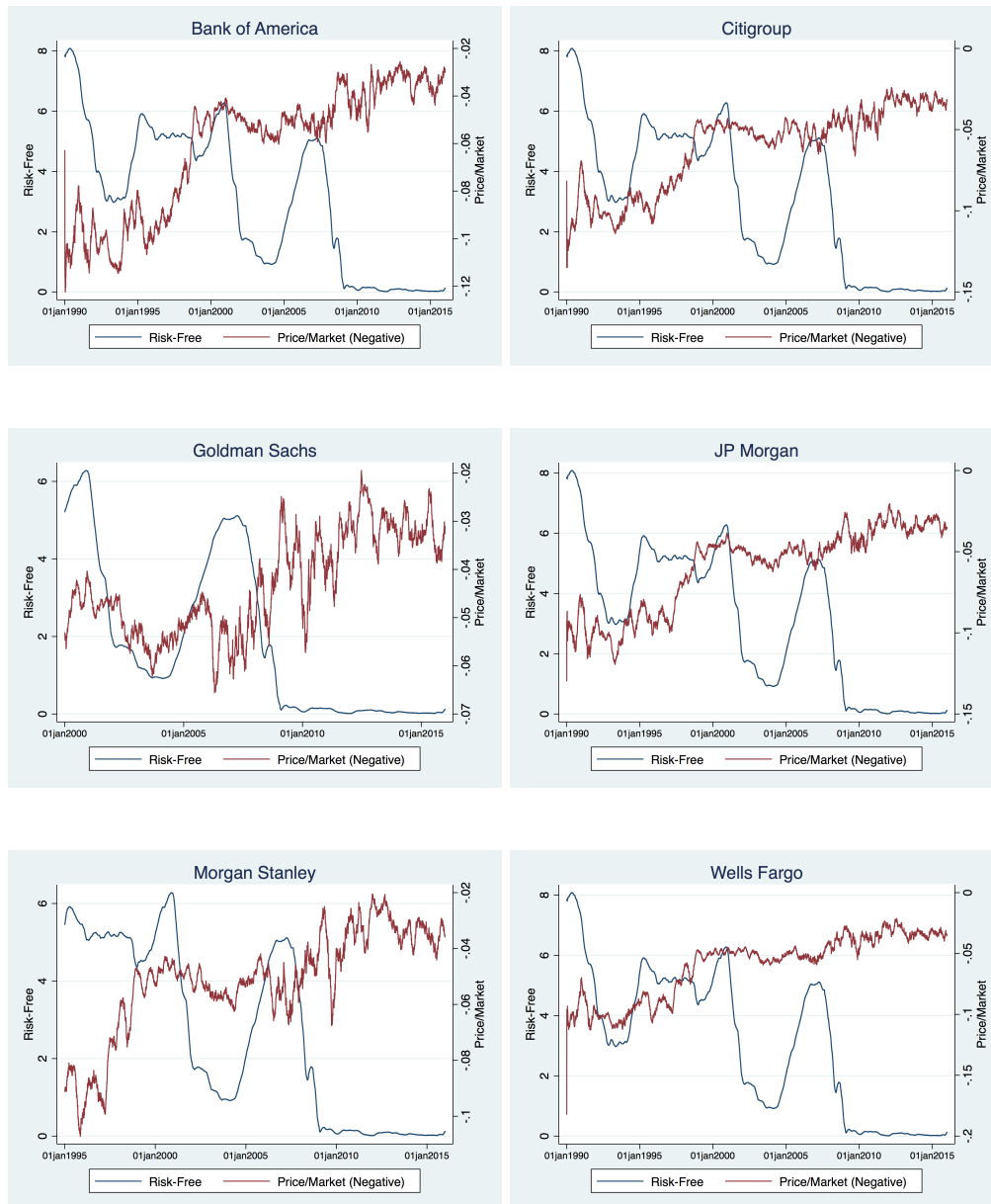
## 4 Interest Rate Changes vs. Bank Stock Price Changes

We also wanted to look at the relationship between movements in the interest rate and movements in bank stock prices. In this first cut, I've just looked at the correlation between movements in the stock price (both with and without dividing by the S&P 500) and movements in interest rate using the graphs below. I'm using a basic three-month moving average to smooth this data. For the risk-free rate, we're using the rate on a three-month treasury (as we do in our Baker-Wurgler calculations).

### 4.1 Bank stock price and risk-free rates



## 4.2 Bank stock price (relative to market) and risk-free rates



## 5 Cross-sectional relationship between MVE/assets ratio and leverage

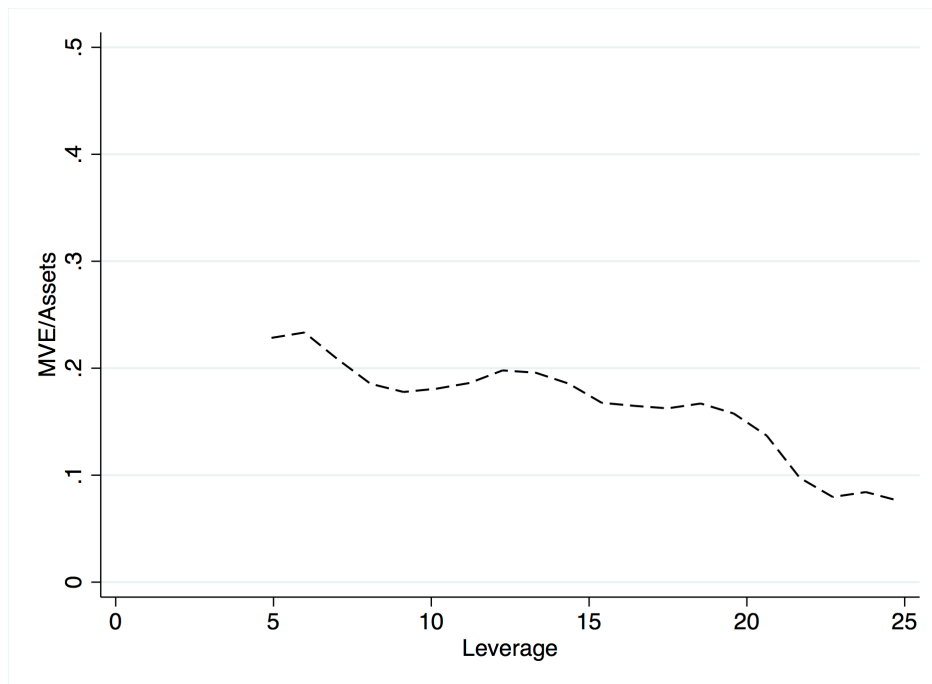
Below, we reproduce our Baker-Wurgler beta/leverage analysis, but instead of beta, our dependent variable is the ratio of market value of equity to assets. We do this analysis for the baseline assets measure and for risk-adjusted assets. As expected, we see that in the cross-section there is a strong negative relationship between leverage and MVE/assets. Like Baker-Wurgler, our measure of leverage is the inverse tier 1 ratio. The R-squared is on the same order of magnitude as it was for our basic BW result.

We also present these results using a kernel regression (per BW) of MVE/assets on the inverse tier 1 ratio.

Table 1: Relationship between MVE Assets Ratio and Leverage

Dependent Variable:	MVE/Assets	MVE/Risk-Adjusted Assets
	(1)	(2)
Leverage	-0.00270*** [0.000701]	-0.0123*** [0.00148]
Constant	0.218*** [0.00856]	0.426*** [0.0182]
Observations	6,453	6,145
Adjusted R-squared	0.002	0.011

Figure 1: MVE Assets Ratio and Bank Leverage





## 6 TBDs Remaining and Status

- Compute fraction of bank liabilities that is deposits. Also compute fraction that is secured liabilities.
  - NOTE: I have the data to do this, but am trying to understand Call Reports to make sure I am choosing the correct series. It looks like the secured liabilities measure is not available that far back (it appears to be missing until 2007 for our institutions).
- Look at how commonly a bank loses 80% of its equity value without having to be bailed out in some way.
  - NOTE: I am not sure how best to do this or what window we should be looking at (i.e. maybe 80% loss in a year?).
- MVE/assets and beta for 1998-2008 Lehman and Bear
  - NOTE: Need to pull new data for this, will take care of ASAP.
- Literature review around:
  - Falling price-to-book ratios
  - Barro (and others) on catastrophe being priced higher today than before
- For our Big 6 do a plot of log price equals log profits per share plus log price/earnings.
  - NOTE: Need to pull new data for this, will take care of ASAP.
- How far back does comparable preferred stock go?
  - We only have three banks (Goldman, BAML, and Morgan Stanley) that issue floating preferreds that date back to the pre-crisis period. They don't go back all that far – the earliest is the Goldman Series D preferred which became available in 2005.
- Switch one correlation (flip so negative)