

# Supervisory Information from Equity Prices

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Please note that the views expressed herein are my own and not necessarily those of the Federal Reserve Bank of San Francisco or of the Federal Reserve System.

# Overview

The equity markets are a well-established monitoring source for individual firms.

The question here is whether that monitoring could complement supervisory monitoring of BHCs.

I will focus here more on practical issues regarding the supervisory use of BHC stock prices and much less on theoretical questions of whether it is appropriate.

Note that my focus is on monitoring BHC equity prices, not borrower equity prices. (Dahiya, Saunders & Srinivasan, *JoF*, 2003)

# Overview

After some background discussion on how to transform equity prices for clearer monitoring signals, I'll present some empirical evidence on:

- contemporaneous correlations of equity market variables with supervisory BOPEC ratings;
- historical time-series correlations between these two sets of variables; and
- analysis of the out-of-sample forecasting accuracy of BOPEC change signals derived from equity markets.

# Background: Public BHCS

To what extent are BHCs publicly traded?

In 1990, 1,296 BHCs with \$2.13 trillion in assets.

In 1999, 1,435 BHCs with \$4.45 trillion in assets.

In 2003, 1,982 BHCs with \$8.75 trillion in assets.

(NOTE: The BHC definition used for 2003 is broader than that used for 1990 and 1999.)

Publicly traded:

In 1990, 239 BHCs: 18% of total, but 74% of assets.

In 1999, 322 BHCs: 22% of total, but 86% of assets.

In 2003, 431 BHCs: 22% of total, but 77% of assets.

As a reference, Flannery (1998) claims that 55% of BHC assets were held by BHCs with publicly traded debt.

# Background: Finance theory

Finance theory argues that an efficient market fully reflects all publicly available information in determining security prices.

In general terms, the U.S. equity market is considered an efficient market that quickly incorporates firm-specific and macro-level information into stock prices.

However, we must remember that the risk-taking attitudes of equity investors are different than those of supervisors.

- Relative emphasis on upside risks vs. downside risks

# Background: Finance theory (con't.)

How can we address this mismatch of risk attitudes?

- First, supervisors are better off focusing on longer-term stock price movements, say monthly or longer.  
(Although large, short-term moves should be informative as well.)
- Second, supervisors need to transform equity prices to reduce the impact of the risk preference mismatch and extract useful equity market signals.

# Background: Data transformations

## Simple data transformation:

subtract a wider market return from the BHC return  
(analysis could be done at a Bloomberg terminal)

- This type of benchmarking should help isolate investors' firm-specific views
- Several benchmarks are available, from the entire stock market to some S&P banking sector indices

## Background: Data transformations (con't.)

### Simple, model-driven data transformation:

estimate the CAPM model and examine cumulative abnormal returns

(analysis could be done with Bloomberg data)

- $AR_{it} = R_{it} - \alpha_i - \beta_i R_{mt}$  for a several year period
- Cumulate and standardized these abnormal returns
- Analyze over monthly and quarterly periods

# Background: Data transformations (con't.)

## Transformation via the Merton model:

estimate BHC-specific “distance-to-default” measures  
(analysis done by MKMV)

- Equity is a put option on the firm’s assets that is written by creditors and held by investors
- Use an option-pricing model to impute the firm’s asset value and asset volatility
- Transform theoretical DTD measure into actual estimates of default probability

# Empirical Evidence

So far, my discussion of the supervisory use of BHC equity price data has been theoretical.

Now, let's turn to the empirical evidence:

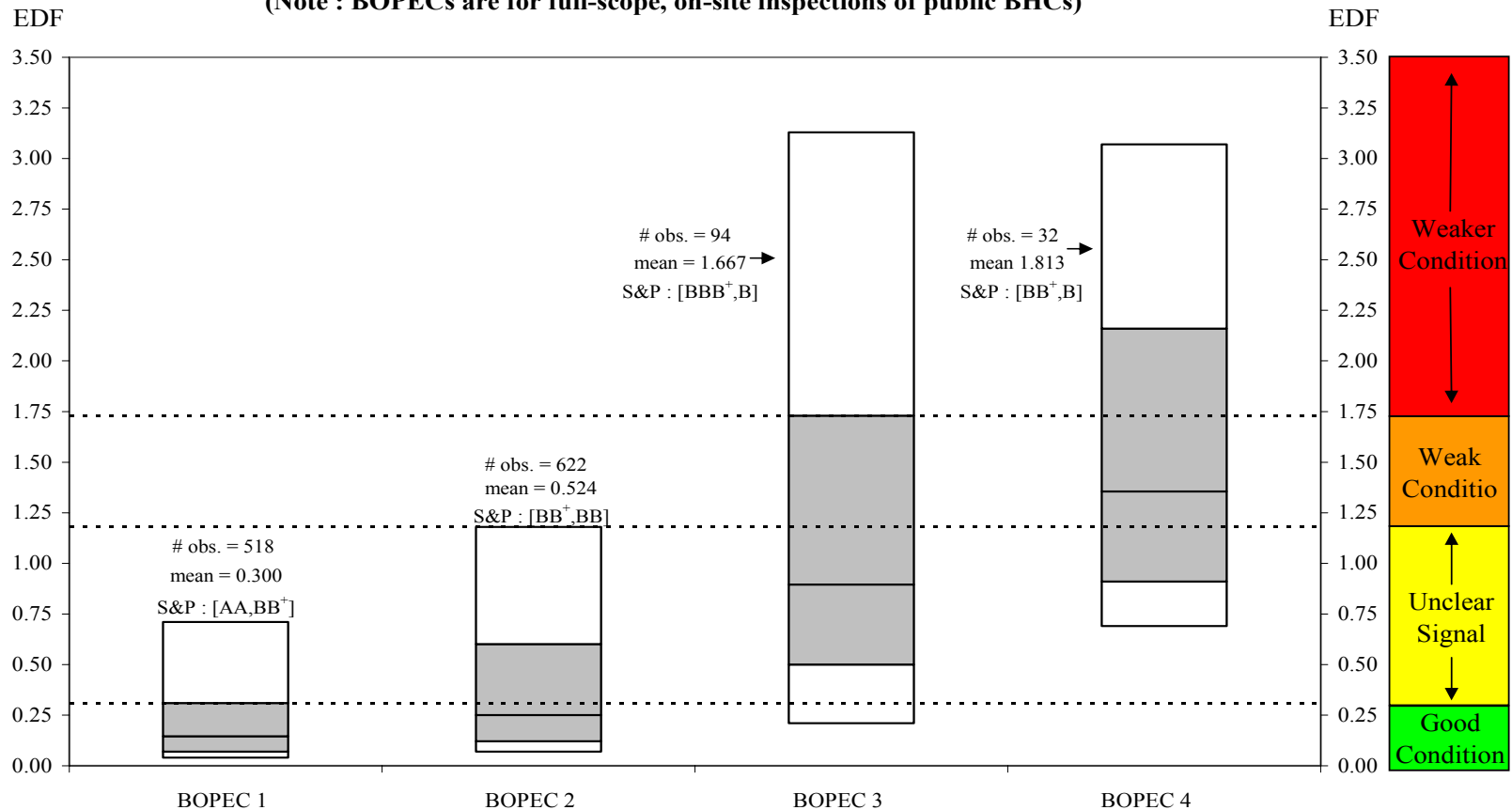
- contemporaneous correlations
- historical time-series correlations
- out-of-sample forecast accuracy

# Empirical Evidence: Contemporaneous correlations

Exhibit 1a.

## Mapping EDFs to BOPEC ratings for the period 1990.Q3 - 2000.Q4

(Note : BOPECs are for full-scope, on-site inspections of public BHCs)



Note: The bottom line of each bar is the 10% quantile. The subsequent lines represent the 25%, 50%, 75%, & 90% quantiles.

## **Empirical Evidence:**

### **Contemporaneous correlations**

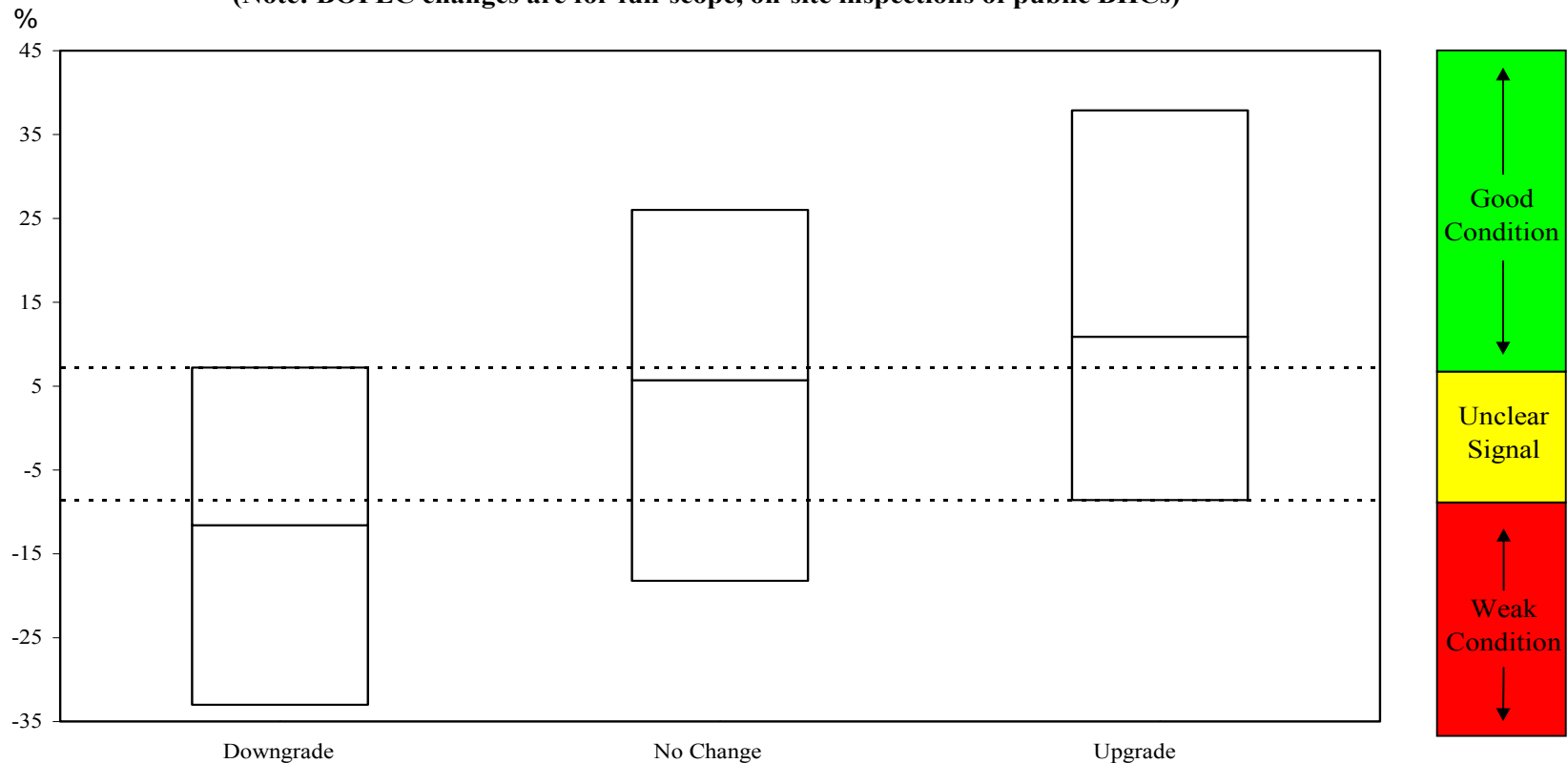
This graph presents the contemporaneous correlation between EDFs and BOPECs, based on about 1,300 BOPEC assignments to 405 unique BHCs from 1990.Q3 through 2000.Q4.

Each bar presents the distribution of EDF values assigned to each BOPEC rating from 1 through 4.

The color scale on the right presents a reasonable interpretation of signal clarity and condition.  
(“Unclear” because too many possible BOPEC outcomes.)

# Empirical Evidence: Contemporaneous correlations

**Exhibit 3b.**  
**Mapping BHC excess stock returns based on the S&P 500 index return  
to BOPEC rating changes  
for the period 1986.Q2 - 2000.Q4**  
(Note: BOPEC changes are for full-scope, on-site inspections of public BHCs)



Note: The bottom line of each bar is the 25% percentile. The subsequent lines represent the 50% and 75% percentiles

# **Empirical Evidence:**

## **Contemporaneous correlations**

This graph presents the contemporaneous correlation between one-year excess BHC stock returns relative to the S&P500 index and BOPEC changes.

(Based on 2,810 BOPECs for 556 unique BHCs from 1992.Q2-2002.Q4.)

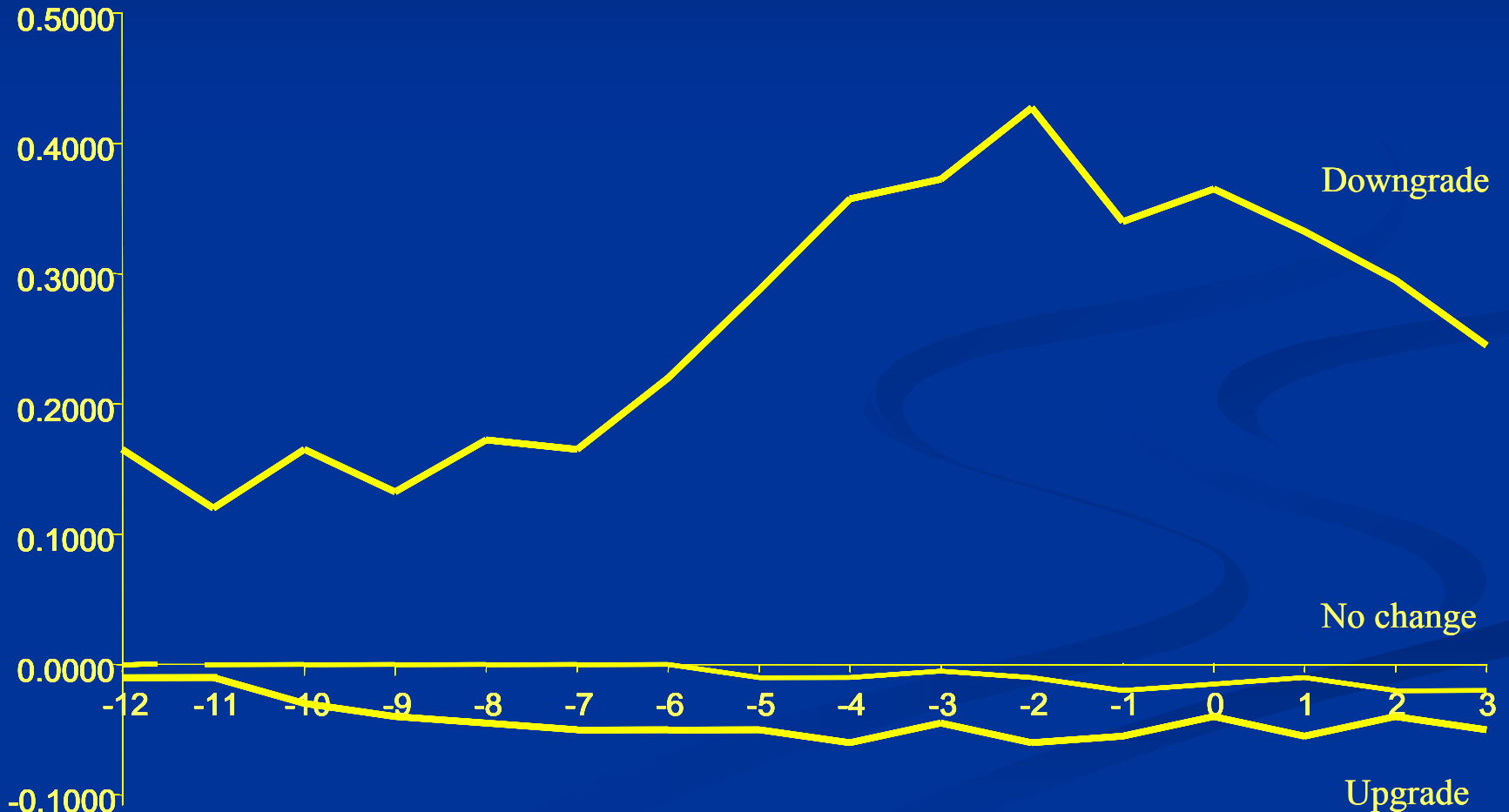
Each bar presents the distribution of these stock returns for BOPEC downgrades, upgrades and no changes.

The color scale on the right presents a reasonable interpretation of signal clarity and condition.

(“Unclear” because too many possible BOPEC outcomes.)

# Empirical Evidence: Time-series correlations

Event study: adjusted EDFs for BHCs assigned BOPEC ratings



# Empirical Evidence: Time-series correlations

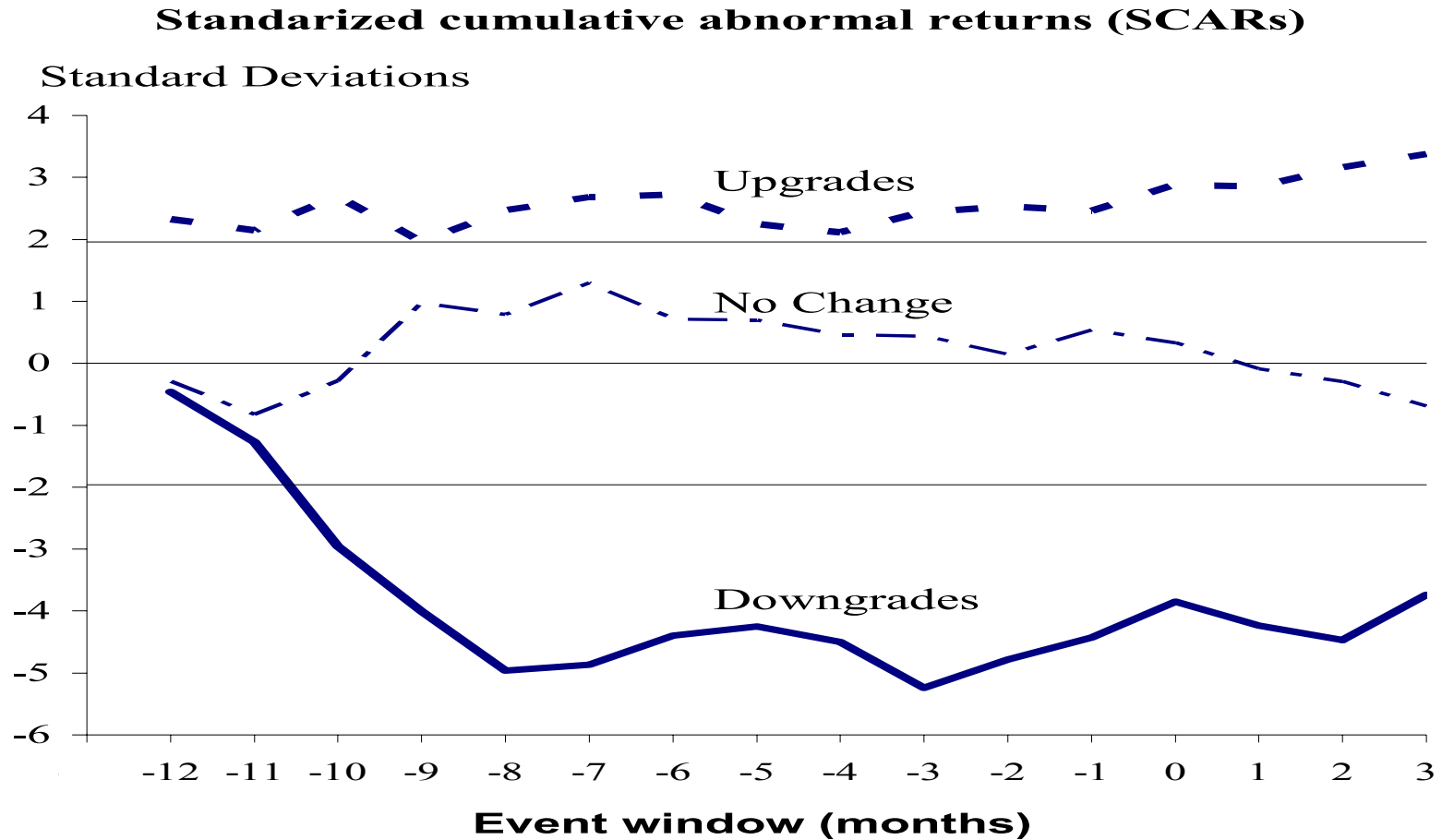
This graph presents the time-series correlation between median-adjusted EDFs and BOPEC changes.

(Based on about 1,300 BOPEC assignments to 405 unique BHCs from 1990.Q3 through 2000.Q4.)

We adjusted the EDFs by subtracting the median EDF of all BHCs that have the same lagged BOPEC ratings.

Using the sign test, EDF measures for BOPEC upgrades and downgrades are of the right sign and statistically significant at up 12 months prior to the change.

# Empirical Evidence: Time-series correlations



Note: The horizontal lines at  $\pm 1.96$  are the 95% confidence interval.

# Empirical Evidence: Time-series correlations

This graph presents the time-series correlation between BHC SCARs and BOPEC changes.

(Based on about 813 BOPEC assignments from 1990 through 1999.)

Note that standard hypothesis testing is possible here, so the  $\pm 2$  standard error band is graphed.

The upgrade and downgrade variables are of the right sign and statistically significant at least 10 months prior to the change, while the “no change” variable is never significantly different from zero.

# Empirical Evidence: Signal accuracy

## Exhibit 4A.

### Distribution of quarterly EDF changes for BHCs

<b>10%</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>90%</b>
-0.19	-0.06	0.00	0.06	0.23

## Exhibit 4B.

### Forecast Accuracy of Quarterly EDF changes

Sample period from 1990.Q4 through 2000.Q2

	Actual BOPEC outcome		
	Upgrades	Downgrades	No change
<hr/>			
Upgrade signal: EDF change < -0.19% (10th pctile)			
Accuracy at 4 quarters prior to inspection	39.5%	6.6%	53.9%
Accuracy at 1 quarter prior to inspection	29.1%	12.8%	58.1%
Accuracy at inspection	25.6%	14.1%	74.2%
Downgrade signal: EDF change > 0.23% (90th pctile)			
Accuracy at 4 quarters prior to inspection	13.5%	15.7%	70.8%
Accuracy at 1 quarter prior to inspection	11.2%	24.5%	64.3%
Accuracy at inspection	15.4%	21.2%	84.4%
<hr/>			
Sample frequency of BOPEC rating outcomes	16.5%	8.7%	74.8%

# Empirical Evidence: Signal accuracy

This table presents the forecast accuracy of EDF changes of certain magnitudes with respect to future BOPEC changes.

(Based on about 1,200 BOPECs assigned over the period 1990.Q4 to 2000.Q2.)

Given an EDF downgrade signal (i.e., EDF change  $> 0.23$ ), 16% actually downgraded a year later and 25% a quarter later, relative to a 9% sample frequency.

The results for EDF upgrade signals are stronger, which is partly a function of the data period.

# Empirical Evidence: Signal accuracy

**Exhibit 6b: Forecast Accuracy of Year-Over-Year Stock Price Changes  
Relative to S&P 500 price change**

	Actual Outcome		
	Upgrade	Downgrade	No change
<b>Downgrade signal: stock price change &lt; -34.8% (10th ptile)</b>			
Accuracy 4 quarters prior	5.0%	26.8%	68.2%
Accuracy 1 quarter prior	3.6%	41.5%	54.9%
<b>Upgrade signal: stock price change &gt; 54.2% (90th ptile)</b>			
Accuracy 4 quarters prior	29.4%	5.7%	64.9%
Accuracy 1 quarter prior	30.3%	3.0%	66.7%
Sample frequency of BOPEC ratings outcomes	13.1%	13.3%	73.6%

# Empirical Evidence: Signal accuracy

This table presents the forecast accuracy of one-year excess stock returns of certain magnitudes with respect to future BOPEC changes.

(Based on BOPECs assigned over the period 1990.Q3 to 2002.Q4.)

Given a downgrade signal (i.e., one-year return  $< -35\%$ ), 27% are actually downgraded a year later and 42% a quarter later, relative to a 13% sample frequency.

The results for upgrade signals are strong as well.

# Conclusion

Our empirical results suggest that equity markets can anticipate BOPEC assignments and hence that BHC equity prices could be used to complement supervisory monitoring efforts.

The questions we now face are:

How much additional benefit is afforded by equity market information?

How do we best incorporate that information into supervisory monitoring?

# Conclusion

Our preliminary work on this topic suggests that the “cost” of one correct BOPEC downgrade signal a year prior to assignment is about 3 incorrect downgrade signals.

Is this “benefit” worth the “cost” for supervisors?

Although integrating equity market information into supervisory monitoring is a challenge, it seems clear that equity markets do generate information that could be useful for that purpose.