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Market prices, analysts’ predictions, and Covid19

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ABSTRACT
This study employs a relatively new statistical method to analyze the time-series of US market prices. Specifically, it shows, that during Covid19, the strongest structural breaks happened. Moreover, since 1993 analysts were not able to predict market stock prices significantly at the 5% level. The new statistical method allows for a better analysis of market prices and analysts’ recommendations.

1. Introduction and literature review
The analysis of market prices in the US has been going on for decades. A relatively new method is employed. The method is State Space Model (SSM) (Durbin and Koopman, 2012). Employing this method shows that the greatest structural breaks in US market prices happened because of Covid19. Moreover, since 1993, analysts were not able to predict market prices significantly at the 5% level. Analysts are too optimistic in their predictions (Lin et al., 2013). Therefore, in the Covid19 their predictions were awful. Overall, since 1993 they failed. OLS shows a significant negative relationship to market prices. However, employing SSM shows insignificance. Analysts are too optimistic and more accurate analysts make more profitable recommendations (Ertimur et al., 2007). The relationship between analysts’ recommendations and the business press is also studied (Ahn et al., 2019). Moreover, female analysts are more conservative than male analysts (Bosquet et al., 2014). The over-optimism of analysts has a negative impact on long-run performance of firms following private placements of equity (Lin et al., 2013). Analysts optimism cause them to identify under-valued stocks but not over-valued stocks (Medovikov, 2014).

The mean recommendation of analysts of market prices is not statistically significant in predicting market prices. While OLS shows a significant relationship, employing SSM shows that this relationship is insignificant. The negative additive outlier for the US market price is in October 2019 and December 2020 due to Covid19. The maximum state shock is in December 2009 and January 2010 (the sub-prime crisis), and in October 2019 (the Covid19). In October 2019 and November and December 2020 there are negative significant downsides in market prices. Fig. 1 illustrates US market price without adjustments. Fig. 2 illustrates US market price with these downsides (Figs. 3 and 4).

Section 2 presents the methodology and data, Section 3 discusses the results, and Section 4 concludes.
2. Data and statistical method

2.1. Data

The sample is monthly observations from 1993 to 2020. More than 2.5 million market prices are extracted from CRSP (the Center for Research in Securities Prices). More than 5 million Analysts’ mean recommendations are extracted from I/B/E/S. Market average price is the average of stock prices in NYSE, AMEX, and Nasdaq. Mean market recommendation is the average of all mean recommendations for all stocks in the specific month. Table 1 presents the descriptive statistics of the variables. Table 2 reports, that when analysts’ recommendations to buy are higher (lower score), the market prices are higher. However, employing SSM shows an insignificant relationship.

2.2. The state space model and methodology

The model employed is as follows:

Mean Market Price (MMP) is a vector of response for each of the 326 monthly observations. MMP is the response variable and mean market recommendation (MMR) is the predictor.

\[ MMP = (MMP_1, MMP_2, ..., MMP_{326}) \]  

(1)
Fig. 3. illustrates the standardized residuals for MMP. These are the errors from the MMP to the MMR over time ($\varepsilon_t$). As shown, MMP is out of the 3$\sigma$ layers at the end of 2009 and in 2020. However, in 2020 the breech of the layer on the downside is much more profound.

Fig. 4. illustrates the maximal state shock statistics. It is shown that the maximal shocks to market prices are in the sub-prime crisis (around 2009) and in the Covid pandemic (2019 and 2020).

Table 1
Descriptive statistics.

| Variable | N  | Mean   | Std Dev | Max    | Min    |
|---------|----|--------|---------|--------|--------|
| MMP     | 326| 40.83302| 19.12141| 13312  | 85.87171|
| MMR     | 326| 2.32292 | 0.10726 | 757.27122 | 2.5757 |
Table 2

Presents the correlation between the variables.

| MMP | MMR |
|-----|-----|
| 1   | -0.7279 |
| MMR | 1   |

Table 3 presents regression results from State Space Model (SSM). MMP is mean market price and MMR is mean market recommendation.

| Response Variable | Regression Variable | Estimate | STD | t Value | Pr > |t| |
|-------------------|---------------------|---------|-----|---------|------|---|
| MMP               | MMR                 | 13.6    | 7.9 | 1.72    | 0.0855 |

3. Results

Table 3 presents the results of the regression, where mean market recommendation (MMR) is insignificant at the 5% level.

Table 3. Regression Parameter Estimates

Table 4 presents the estimates and significance of the integrated random walk and the white noise, which are both present in this model.

Table 5 just presents the dates of the additive outlier.

Table 6 presents the structural breaks in the intercept in October 2019 and December 2020. October 2019 and December 2020 are both related to Covid19. Covid19 became public news in October 2019.

While OLS presents a highly negative significant relationship, the SSM reports an insignificant relationship (and the point estimate is even positive), (Table 7).

Table 2 Pearson correlation coefficients 1993 to 2020

Table 2 reports Pearson correlation coefficients of mean market price (MMP) and mean market recommendation (MMR). The sample is from 1993 to 2020. All Pearson correlation coefficients are different from zero at the 1% significance level.

\[ MMP_t = Z_t \alpha_t + \text{MMR}_t \gamma + \epsilon_t \]

Observation equation

\[ \alpha_{t+1} = T_t \alpha_t + W_{t+1} \gamma + C_{t+1} + u_t \]

State transition equation

\[ a_1 = C_1 + A_1 \delta + W_1 \gamma + u_1 \]

Initial condition

\[ \epsilon_t, u_t \sim N(0, \sigma_{\epsilon_t}, \sigma_{u_t}) \]

\( T \) is the transition matrix

\( C_1 \) is the initial condition

\( \gamma \) is the coefficient of the random walk

\( Z_t \) is the random variable of the states

The SSM model allows for structural breaks, regression, white noise, and integrated random walk (IRW). The prices follow an IRW.
4. Conclusions

This article explores the time-series of market prices in the US. The model employed is the State Space Model (SSM). It is shown the strongest structural breaks in the market price are during the Covid19 pandemic. Analysts’ recommendations do not predict market prices significantly. Specifically, analysts are too optimistic. While OLS reports a significant negative relationship to market price, the SSM shows insignificance. The major advantages of the SSM are to show the structural breaks and model the random-walk in the MMP. These components are mandatory for true inferences.

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Data availability

Unfortunately, the author has no permission to share the data.

Declaration of Competing Interest

No conflicts of interest.

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