# 5 Results

## *5.1 Pricing*

For analyzing the impact of the clearing mandate on prices, I compare USD denominated contracts using LIBOR as the floating rate index, against CAD denominated contracts using the CDOR as the floating rate index. The USD LIBOR contracts are subject to the CFTC clearing mandate while the CAD CDOR contracts are not. Table 8 lists the diff-in-diff results for the swap premium, pooling data from all phases. Column 1 shows a basic model without any controls for contract characteristics. Column 2 (full model) shows the effects additional controls, such as the (log) notional value of the contract, day of the week, and period of trading and whether the notional value was “capped” (i.e., the exact value was not reported to the trade repository).

Per the basic model , the clearing mandate causes a ~14 bps rise in premia across the three phases in this model. In the full model with additional controls for contract characteristics, premia rise by ~13 bps. These results are qualitatively in line with the theoretical model that reducing the riskiness of the contract increases its price.

Examining the control variables, beginning with the trading day, and using Wednesday as the reference level, I note that there is a 1.0-3.0 bps increase in the premium depending on the trading day. There is also a 1.0-1.3 bps decrease in the premium for trading in morning, afternoon or off hours trading sessions (as compared to midday). Both results contrast with assumptions of “efficient markets,” where there should be no arbitrage opportunities by trading during special days or times. A one percent increase in the notional value is associated with a 0.77 bps increase in the premium. Again, this contrasts with expectations from “efficient market” assumptions because arbitrage opportunities exist (for example, a dealer can make a riskless profit by agreeing to receive a fixed rate on a higher-priced “large” contract and agreeing to pay the fixed-rate for two lower-priced “small” contracts). Finally, a one-year increase in the tenor is associated with a 0.03 bps increase in the premium. It is difficult to determine whether this represents a riskless-arbitrage opportunity or a difference in perceived riskiness for longer-dated contracts. Although many of the covariates are statistically significant, the magnitudes of the effects are small, ranging from 0.03 to 3 bps.

Table 9 shows the result of a diff-in-diff analysis on each phase separately. In phase 1, there is a ~5.3 bps increase in premia after the implementation of the mandate. As noted previously, there was a 16% increase in the cleared volume following implementation of phase 1. In phase 2, there was an additional ~2.6 bps increase in premia. In phase 3, premia increased by ~16 bps. These results generally hold to the idea that as more of the market is cleared, there is a perceived reduction in counterparty risk and swap premia rise. The results are consistent with the pooled diff-in-diff, with most of the effect occurring during the third phase of the mandate.

Table 10 shows the results of a similar regression using an alternative currency pair. The CFTC clearing mandate also affected contracts denominated in GBP using the LIBOR as the reference rate (with the same implementation dates as the USD clearing mandate). These contracts now serve as the treatment group. The clearing mandate did not apply to Swiss Franc (CHF) denominated contracts, and these contracts now serve as the comparison group. The clearing mandate had a similar (but smaller) impact on prices of GBP-denominated swaps, further strengthening my belief that clearing reduces counterparty risk and increases contract premia.

*Table 8 Diff-in-diff results for prices pooling all phases together.*

*Column 1 shows results for a basic diff-in-diff model without controlling for any covariates. Column 2 cotrols for contract charatceristics such as the tenor (in years), (log) notional value, whether notional is capped, whether the swap was traded on an eelctronic swap execution facility, the trading session and the trading day. The parameter of interest is the interaction term Group * Period, which shows an effect of 13.4-14.2 bps increase in premia for the treatment group once clearing is enacted.*

**Diff-in-diff Regression Results**

| | Dependent variable: Premium | |
|---|---|---|
| | Basic Model | Full Model |
| | (1) | (2) |
| Group | -0.8889$^{*}$ | -0.7683 |
| | (0.4917) | (0.4900) |
| Period | -13.6369$^{***}$ | -13.2955$^{***}$ |
| | (0.6641) | (0.6610) |
| Tenor | | 0.0362$^{***}$ |
| | | (0.0086) |
| Log Notional | | 0.7755$^{***}$ |
| | | (0.0671) |
| Capped | | -0.9311$^{***}$ |
| | | (0.1849) |
| SEF | | 0.6922 |
| | | (2.5197) |
| Morning Session | | -1.0238$^{***}$ |
| | | (0.1843) |
| Afternoon Session | | -1.2368$^{***}$ |
| | | (0.1814) |
| Off Hours | | -1.2907$^{***}$ |
| | | (0.2125) |

| | | |
|---|---|---|
| Monday | | 1.5672*** |
| | | (0.2244) |
| Tuesday | | 2.3944*** |
| | | (0.2070) |
| Thursday | | 2.7672*** |
| | | (0.2005) |
| Friday | | 0.9566*** |
| | | (0.2124) |
| Group * Period | 14.2183*** | 13.4103*** |
| | (0.6833) | (0.6839) |
| Constant | -0.2415 | -14.1707*** |
| | (0.4718) | (1.2407) |
| Observations | 27,210 | 27,210 |
| $R^2$ | 0.0283 | 0.0444 |
| Adjusted $R^2$ | 0.0282 | 0.0440 |
| Residual Std. Error | 11.3530 (df = 27206) | 11.2607 (df = 27195) |
| F Statistic | 264.3342*** (df = 3; 27206) | 90.3482*** (df = 14; 27195) |
| *Note:* | | *p<0.1; **p<0.05; ***p<0.01 |

*Table 9 Diff-in-diff results for prices by each implementation phase separately.*

*This analysis uses the same "full model" described earlier (controlling for contract charatceristics). There is a 5.3 bps increase in premia in phase 1, a 2.7 bps increase in premia in phase 2 and a 16.2 bps increase in premia in phase 3 (coefficients on the Gorup * Period term).*

**By Phase Results: Full Model**

| | Dependent variable: Premium | | |
|---|---|---|---|
| | Phase 1 | Phase 2 | Phase 3 |
| | (1) | (2) | (3) |
| Group | -2.789*** | 2.327*** | 3.139*** |
| | (0.525) | (0.886) | (1.205) |
| Period | -4.898*** | -4.150*** | -12.360*** |
| | (0.875) | (1.309) | (1.338) |
| Tenor | -0.050*** | 0.064*** | 0.086*** |
| | (0.013) | (0.013) | (0.016) |
| Notional | -0.489*** | 0.685*** | 1.506*** |
| | (0.094) | (0.109) | (0.125) |
| Capped | -0.727*** | -0.583** | -1.575*** |
| | (0.268) | (0.287) | (0.345) |
| Morning Session | -0.387 | 0.788*** | -2.375*** |
| | (0.265) | (0.292) | (0.340) |
| Afternoon Session | -1.170*** | -0.571** | -0.538 |
| | (0.264) | (0.280) | (0.342) |
| Off Hours | -1.196*** | 1.594*** | -5.542*** |
| | (0.309) | (0.334) | (0.392) |
| Monday | 2.017*** | 6.666*** | -5.821*** |
| | (0.323) | (0.367) | (0.409) |
| Tuesday | 0.741** | 8.913*** | -3.854*** |

| | | | |
|---|---|---|---|
| | (0.312) | (0.326) | (0.377) |
| Thursday | 2.025*** | 8.909*** | -3.700*** |
| | (0.306) | (0.306) | (0.376) |
| Friday | 1.642*** | 5.832*** | -4.480*** |
| | (0.325) | (0.320) | (0.402) |
| Group * Period | 5.308*** | 2.658** | 16.277*** |
| | (0.899) | (1.336) | (1.408) |
| Constant | 11.804*** | -22.064*** | -27.840*** |
| | (1.654) | (2.101) | (2.446) |
| Observations | 7,561 | 10,856 | 8,793 |
| $R^2$ | 0.025 | 0.109 | 0.179 |
| Adjusted $R^2$ | 0.024 | 0.108 | 0.178 |
| Residual Std. Error | 8.635 (df = 7547) | 11.002 (df = 10842) | 11.861 (df = 8779) |
| F Statistic | 15.068*** (df = 13; 7547) | 102.336*** (df = 13; 10842) | 147.232*** (df = 13; 8779) |
| *Note:* | | | *p<0.1; **p<0.05; ***p<0.01 |

*Table 10 Diff-in-diff using alternative currency pair*

*GBP denominated contracts serve as the treatment group and CHF denominated contracts serve as the comparison group. The interaction term Group * Period shows a 7.5-8.3 bps increase (depending on model) for the treatment group once clearing becomes mandatory.*

**Alternative Currencies Diff-in-diff Results (GBP vs. CHF)**

| | Dependent variable: Premium | |
|---|---|---|
| | Basic Model | Full Model |
| | (1) | (2) |
| Group | -0.2734 | -0.9492 |
| | (1.2232) | (1.2023) |
| Period | -6.6242*** | -8.2303*** |
| | (1.4576) | (1.4435) |
| Tenor | | 0.0974*** |
| | | (0.0193) |
| Log Notional | | 0.6572*** |
| | | (0.1811) |
| Capped | | -0.4361 |
| | | (0.5052) |
| Morning Session | | -0.9820** |
| | | (0.4967) |
| Afternoon Session | | -2.5981*** |
| | | (0.4186) |
| Off Hours | | -2.4152*** |
| | | (0.7555) |
| Monday | | 3.1430*** |
| | | (0.5643) |
| Tuesday | | 3.5697*** |
| | | (0.5050) |
| Thursday | | 3.0135*** |
| | | (0.4984) |
| Friday | | 1.5464*** |
| | | (0.5515) |
| Group * Period | 7.4610*** | 8.2859*** |
| | (1.5404) | (1.5143) |
| Constant | -3.7350*** | -15.0964*** |

| | | |
|---|---|---|
| | (1.1343) | (3.1718) |
| Observations | 3,522 | 3,522 |
| $R^2$ | 0.0168 | 0.0580 |
| Adjusted $R^2$ | 0.0159 | 0.0546 |
| Residual Std. Error | 10.3965 (df = 3518) | 10.1905 (df = 3508) |
| F Statistic | 20.0170*** (df = 3; 3518) | 16.6288*** (df = 13; 3508) |
| *Note:* | | *p<0.1; **p<0.05; ***p<0.01 |

## *5.2 Liquidity*

As noted previously, liquidity is a broad concept with several measures. I begin by examining the impact of the central clearing mandate on the relative bid-ask spread prevalent at the end of the trading day, a measure of the trading cost scaled for the price of the contract. Table 11 shows the results of a diff-in-diff regression for this measure. In the full model, I include the contract tenor as a control variable, as the relative bid-ask spread varies significantly with the contract tenor (for example, the median relative spread for Canadian contracts 1.17% for 10Y contracts to 1.51% for 2Y contracts. For US contracts, the median relative spread varied between 0.27% for 10Y contracts to 1.04% for 2Y contracts). Since the period of study is relatively short and since liquidity is a "market wide," rather than an individual contract-based measure, the opportunity to control for variables that impact liquidity is limited to market-wide metrics[9]. If a longer period were being studied, variables that impact liquidity, such as monetary policy and credit availability could be added as controls. However, these variables did not vary during the brief period studied and cannot be controlled for. Two control variables that proxy financial market conditions are added to the full model: a measure of equity market volatility and a measure for equity market return. For the volatility measure, I use the CBOE Volatility Index (CBOE VIX) and the TSX 60 VIX Index, which measure the 30-day expected realized variance of the S&P 500 Index and its Canadian equivalent, respectively. The Canadian VIX index was launched in April 2021, but S&P provides hypothetical historical values. For equity market returns, I use the returns of the S&P 500 for the US and the S&P/TSX 60 Composite for Canada.

The diff-in-diff results suggest that the clearing mandate does not impact liquidity as measured by relative bid-ask spreads. In the theory section, I argued that we should expect reductions in counterparty risk to cause a narrowing of the bid-ask spread, as the spread is charged by dealers to offset their expected losses from holding inventory, and a reduction in counterparty risk reduces these expected losses. However, the spread is also driven by supply and demand conditions in the market (i.e., the quantity and market order size discussed in the theory section). A reduction in riskiness of IR swaps increases their demand. If the swaps market is monopolistic (that is, new

[9] That is, it doesn't make much sense to talk about the liquidity of a particular 10-year contract. Rather, we look at the liquidity for all 10-year standardized swaps contracts on a given trade date.

swaps dealers face barriers to entry), then incumbent dealers can choose not to adjust their bid-ask spreads and pocket the additional profits from the higher demand.

Examining the control variables, as expected, USD contracts have a slightly smaller (but statistically significant) relative spreads, indicating the USD market is more liquid. Both the equity market volatility and equity market return variables are statistically more significant. This could indicate that when financial market conditions are green, there is a narrowing of the spread (greater liquidity). Finally, the tenor indicators are significant, suggesting shorter length contracts are less liquid.

I examine two additional measures of liquidity. Roll's measure is an estimate of bid-ask spreads that might have prevailed during the trading day and is obtained from transaction data (fixed rate and trade time). Table 12 shows the results of a diff-in-diff regression for this measure. The contract tenor as well as the equity market volatility and equity market return variables from the previous discussion are included as control variables in the full model. As with the relative bid-ask spread, Roll's measure does not show a statistically significant (at the 5% level) change in trading costs due to the clearing mandate.

The Amihud illiquidity measure is an estimate of the average price impact. I use the notional contract amount as the "order size" and the (log) difference in the fixed rate between two trades as the (percent) change in price. I express the results in percent change per million dollars of order quantity for easier interpretation. Table 13 show the results for the Amihud illiquidity measure diff-in-diff analysis. The Amihud illiquidity measure shows a statistically significant but small (0.36 percentage point change in price/million dollars) impact of the clearing mandate.

*Table 11 Diff-in-diff analysis of relative bid-ask spreads.*

*The dependent variable is the Relative Bid-Ask Spread from the last quote of the trading day. For the full model, control variables are the contract tenor, relevant stock market (TSX or S&P 500) returns and volatility. Stock market returns are calculated as the percent change from the previous trading day's adjusted closing price (where adjustments are made for dividends, stock splits and other rights offers). The volatility measures are the CBOE VIX and TSX 60 VIXI indices.*

**Relative Bid-Ask Spread diff-in-diff Analysis**

| | *Dependent variable:* | |
|---|---|---|
| | Relative Spread | |
| | Simple Model | Full Model |
| | (1) | (2) |
| Group | -0.005*** | -0.005*** |
| | (0.001) | (0.001) |
| Period | 0.0001 | -0.0001 |
| | (0.001) | (0.001) |
| Tenor (2Y) | | 0.006*** |
| | | (0.001) |
| Tenor (5Y) | | 0.003*** |
| | | (0.001) |
| Equity Return | | -0.056* |
| | | (0.031) |
| Volatility | | -0.0003** |
| | | (0.0001) |
| Group*Period | -0.001 | -0.001 |
| | (0.001) | (0.001) |
| Constant | 0.014*** | 0.016*** |
| | (0.001) | (0.002) |

| | | |
|---|---|---|
| Observations | 360 | 351 |
| $R^2$ | 0.204 | 0.486 |
| Adjusted $R^2$ | 0.198 | 0.476 |
| Residual Std. Error | 0.005 (df = 356) | 0.004 (df = 343) |
| F Statistic | $30.459^{***}$ (df = 3; 356) | $46.369^{***}$ (df = 7; 343) |
| *Note:* | | $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$ |

*Table 12 Diff-in-diff analysis of Roll's Measure.*

*The dependent variable is the daily Roll's Measure (a proxy of the bid-ask spread during the trading day). Control variables are the contract tenor, relevant stock market (TSX or S&P 500) returns and volatility. Stock market returns are calculated as the percent change from the previous trading day's adjusted closing price (where adjustments are made for dividends, stock splits and other rights offers). The volatility measures are the CBOE VIX and TSX 60 VIXI indices.*

**Roll's Measure diff-in-diff Analysis**

| | *Dependent variable:* | |
|---|---|---|
| | Roll's Measure | |
| | Simple Model | Full Model |
| | (1) | (2) |
| Group | $0.368^{***}$ | $0.377^{***}$ |
| | (0.041) | (0.040) |
| Period | 0.040 | 0.042 |
| | (0.063) | (0.062) |
| Tenor (2Y) | | $-0.113^{***}$ |
| | | (0.042) |
| Tenor (5Y) | | 0.044 |
| | | (0.040) |
| Equity Return | | $4.289^{*}$ |
| | | (2.591) |
| Volatility | | -0.009 |
| | | (0.011) |
| Group * Period | $-0.139^{*}$ | $-0.133^{*}$ |
| | (0.079) | (0.078) |
| Constant | $0.069^{**}$ | 0.213 |
| | (0.032) | (0.159) |

| | | |
|---|---|---|
| Observations | 551 | 548 |
| $R^2$ | 0.149 | 0.183 |
| Adjusted $R^2$ | 0.144 | 0.173 |
| Residual Std. Error | 0.393 (df = 547) | 0.387 (df = 540) |
| F Statistic | $31.924^{***}$ (df = 3; 547) | $17.303^{***}$ (df = 7; 540) |
| *Note:* | | $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$ |

*Table 13 Diff-in-diff analysis of Amihud's Illiquidity Measure.*

*The dependent variable is Amihud's Measure (expressed in absolute % change in the fixed rate of the contract per a million dollar of notional value traded). Control variables are the contract tenor, relevant stock market (TSX or S&P 500) returns and volatility. Stock market returns are calculated as the percent change from the previous trading day's adjusted closing price (where adjustments are made for dividends, stock splits and other rights offers). The volatility measures are the CBOE VIX and TSX 60 VIXI indices.*

**Amihud lliquidity Measure diff-in-diff Analysis**

| | *Dependent variable:* | |
|---|---|---|
| | Amihud Illiquidity Measure | |
| | Simple Model | Full Model |
| | (1) | (2) |
| Group | $0.348^{***}$ | $0.367^{***}$ |
| | (0.068) | (0.068) |
| Period | $0.362^{***}$ | $0.364^{***}$ |
| | (0.099) | (0.098) |
| Tenor (2Y) | | 0.018 |
| | | (0.072) |
| Tenor (5Y) | | $0.206^{***}$ |
| | | (0.070) |
| Equity Return | | $12.328^{***}$ |
| | | (4.469) |
| Volatility | | 0.025 |
| | | (0.019) |
| Group * Period | $-0.365^{***}$ | $-0.386^{***}$ |
| | (0.133) | (0.132) |
| Constant | $0.106^{**}$ | -0.344 |

| | | |
|---|---|---|
| | (0.051) | (0.280) |
| Observations | 641 | 635 |
| $R^2$ | 0.048 | 0.077 |
| Adjusted $R^2$ | 0.043 | 0.066 |
| Residual Std. Error | 0.733 (df = 637) | 0.727 (df = 627) |
| F Statistic | $10.674^{***}$ (df = 3; 637) | $7.445^{***}$ (df = 7; 627) |
| *Note:* | | $^{*}$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01 |

### *5.3 Volatility*

I measure price volatility as the daily realized variance of the fixed-rate leg and estimate its response to the clearing mandate with the diff-in-diff specification in equation (53). Each observation is a tenor–currency–day cell; the sample pools the three mandate windows, giving 829 observations after filtering for data availability.

Table 14 reports the diff-in-diff results. Volatility is systematically higher for USD contracts than for CAD contracts: the “Group” coefficient is 6.7 bps (simple model) and 9.5 bps (full model) and is statistically significant at the 1 percent level. By contrast, the “Period” term is economically small ($\approx$ 1 bps) and statistically insignificant, indicating no general drift in volatility over the twenty-day windows around each phase. Most importantly, the interaction term is indistinguishable from zero (point estimates are 0.2 bps in the simple model and –0.6 bps in the full model, both with standard errors $\approx$ 2.5 bps). Thus, clearing did not measurably dampen day-to-day rate volatility under “normal” market conditions.

Control variables behave as expected. Short-dated contracts are more volatile (the 1-year tenor adds 24 bps relative to the 10-year benchmark), while the 15- and 30-year contracts are less volatile. Equity-market returns and VIX-style measures have no incremental explanatory power once swap-specific covariates are included. The modest $R^2$ (about 3 percent in the simple specification and 25 percent in the full specification) is typical for daily RV regressions and reflects the near-random-walk behavior of swap rates in quiet periods.

Theory suggest that any stabilizing benefit of central clearing should be most visible when counterparty-credit concerns flare up. To test this prediction, I re-estimate the diff-in-diff over the June 27–July 13, 2015, window, bracketing the announcement and resolution of the Greek EU referendum[10]. The sample shrinks to 104 observations, and CAD swaps provide a noisy comparison because of their limited exposure to euro-area risk. Table 15 shows that the mandate’s interaction term is –1.6 bps with a 11.9 bps standard error (again not statistically significant).

[10] Between June 27 and July 13, 2015, Greece faced a severe financial crisis culminating in a national referendum held on July 5. On June 27, Prime Minister Alexis Tsipras called the vote after rejecting the austerity terms proposed by the European Commission, European Central Bank, and International Monetary Fund as conditions for further bailout funding to be held on July 5. In the referendum, over 61% of Greeks voted “No” to the proposed terms, signaling public rejection of more austerity. In response, Greece imposed capital controls and temporarily closed banks to prevent financial collapse. Despite the referendum outcome, Tsipras ultimately agreed to even harsher bailout terms on July 13 to keep Greece in the eurozone, effectively neutralizing the referendum’s mandate and averting a potential “Grexit.” See (Sherlick, n.d.) for a full timeline.

Realized volatility would have had to fall by roughly 35 bps (one-third of the sample mean) to achieve conventional significance levels in this small window.

Two factors likely explain the null findings. First, the model in Section 2.5 emphasizes order-flow shocks ($\sigma$) as the primary driver of short-horizon price changes; reducing counterparty-risk therefore moves $\alpha\sigma^2$ only at second order. Second, contemporaneous regulatory changes particularly greater post-trade transparency and the migration to SEF trading may have compressed volatility in both USD and CAD markets, biasing the diff-in-diff toward zero.

*Table 14 Diff-in-diff analysis of volatility of the fixed rate for USD and CAD IR swaps contracts.*

*The dependent variable is the (modified) realized volatility. Tenor is used as an unoredered categorical variable. Equity marker returns are daily total returns on the S&P 500 (for US) or TSX 60 (for Canada). Equity market volatility is the level of the CBOE VIX (for the US) or the S&P VIXI (for Canada)*

**Daily volatility diff-in-diff Analysis**

| | *Dependent variable:* | |
|---|---|---|
| | Realized Volatility | |
| | Simple Model | Full Model |
| | (1) | (2) |
| Group | 0.067*** | 0.095*** |
| | (0.020) | (0.018) |
| Period | 0.009 | 0.018 |
| | (0.024) | (0.021) |
| Equity Mkt Return | | 0.906 |
| | | (0.704) |
| Equity Mkt Volatility | | 0.003 |
| | | (0.003) |
| Tenor 15Y | | -0.053** |
| | | (0.024) |
| Tenor 1Y | | 0.240*** |
| | | (0.025) |
| Tenor 2Y | | 0.047** |
| | | (0.021) |
| Tenor 30Y | | -0.070*** |
| | | (0.023) |

| | | |
|---|---|---|
| Tenor 3Y | | $-0.038^{*}$ |
| | | (0.022) |
| Tenor 4Y | | $-0.052^{**}$ |
| | | (0.023) |
| Tenor 5Y | | $0.043^{**}$ |
| | | (0.020) |
| Tenor 6Y | | $-0.053^{**}$ |
| | | (0.024) |
| Tenor 7Y | | -0.036 |
| | | (0.024) |
| Tenor 8Y | | $-0.067^{***}$ |
| | | (0.024) |
| Tenor 9Y | | $-0.074^{***}$ |
| | | (0.024) |
| Group * period | 0.002 | -0.006 |
| | (0.027) | (0.024) |
| Constant | 0.027 | -0.029 |
| | (0.017) | (0.047) |
| Observations | 829 | 829 |
| $R^2$ | 0.031 | 0.247 |
| Adjusted $R^2$ | 0.028 | 0.232 |
| Residual Std. Error | 0.161 (df = 825) | 0.143 (df = 812) |
| F Statistic | $8.935^{***}$ (df = 3; 825) | $16.612^{***}$ (df = 16; 812) |
| *Note:* | $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$ | |

*Table 15 Diff-in-diff analysis of price volatility during second Grexit referendum*

**Diff-in-diff Analysis of Volatility During GREXIT**

| | *Dependent variable:* |
|---|---|
| | Volatility (Daily Return) |
| Period | -0.002 |
| | (0.087) |
| Group | 0.012 |
| | (0.090) |
| Period x Group | -0.016 |
| | (0.119) |
| Constant | 0.039 |
| | (0.065) |
| Observations | 104 |
| $R^2$ | 0.001 |
| Adjusted $R^2$ | -0.029 |
| Residual Std. Error | 0.300 (df = 100) |
| F Statistic | 0.018 (df = 3; 100) |
| *Note:* | $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$ |