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Macroeconomic Determinants of Accumulated M&A Transaction Values within the U.S. Market

I.V. Tregub, A.F. Butyrskiy

Financial University, Moscow, Russia

ABSTRACT

The corporate wisdom propounds mergers and acquisitions (M&A) as a notable strategy for extensive (non-organic) growth in the market and, as a result, gaining financial advantage and strategic superiority and ascendancy along the way. Hence, this instrument undeniably occupies the highest ranks of instruments for corporate management. Considering all aforementioned, the work object is to research to which extend the macroeconomic indicators have an effect on the annually aggregated volume of mergers and acquisitions, entered within the United States of America in the historical period of 1985–2021. The subject of the study is defined as U.S. mergers and acquisitions market. By employing the ordinary least square method of a multiple linear regression equation, it was determined that logarithmic GDP growth together with the discount rate had a significant positive effect on the explanation of the dependent variable, while the 10-year US Treasury bond yield had a negative relationship. Further, several statistical tests were conducted to ensure the authenticity of results obtained and potential for utilization of the model for the purpose of estimation forward values. The practical significance of the research is recognized as uncovering econometric model for the purpose of forecasting mergers and acquisitions volumes, resulting in effective corporate management decisions with regard to timing and market sentiment.

Keywords: mergers and acquisitions; macroeconomic determinants; econometric model; multiple regression; hypothesis testing; model construction

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INTRODUCTION

Mergers and Acquisitions (M&A) are seen as a well-established device in reference to achievement of strategic objectives amidst multinational corporation executive management [1]. Considering the other options and techniques, this calibrated mechanism is highly rated for its strong potential to create the value for shareholders. For another, the decision-making process regarding M&A transactions is habitually referred to as interdisciplinary, due to application of knowledge, channeled from finance, accounting, law, management, and other fields involved. Besides, the macroeconomics is widely recognized to have a strong impact on an extensive range of corporate actions are built

over financing costs, risk appetite, etc. Granted, it is apparently unlikely to omit that factor in mergers and acquisitions.

Provided facts underpin the utmost importance M&As plays in corporate finance. These circumstances presuppose the particular stimulus to investigate the macro-level drivers of these transactions. The future findings may provide deeper understanding of the processes, enable with sufficient accuracy forecast and estimate the level of dealings on the market. For the purpose of this research, the author restricts himself to the M&A market of the United States — one of the most sophisticated economies, with substantial track record of dealings and authentic statistical data.

LITERATURE OVERVIEW

In several studies, the macroeconomic indicators are repeatedly reaffirmed as critical determinants for the aggregate M&A values. Article, authored by Ralph Nelson in 1959, is conventionally recognized as the groundbreaking work for this hypothesis, where he displayed the interconnection between activity level of mergers and acquisitions and stock market. Subsequently, scholars concur with these findings, narrowing down the focus to the relationship between the macroeconomic environment and M&A dealings [2].

To begin, researches frequently invoke aggregate commercial activity as another possible determinant for fluctuations in M&A volumes [3]. This concept is built on a foundation of ideas, produced by the envoys of economic prosperity theory. Corporations construe an increasing economic activity as the indication of right time to open up fresh opportunities. The over quarter century period of UK history firmly endorses one thesis, when the straight causation between M&A market activity and GDP was stated [4]. For another, credit market theory posited that the sector faces substantial influence from interest rates [5]. Scholars, explaining the phenomenon, underscore the fact that corporations, following the tendency to largely engage leverage in large-scale projects, strive to improve profitability and gain strategic edge [6]. Against that backdrop, firms are likely to pare back the activities in takeovers, should the borrowed funds become expensive or not readily obtainable. Ultimately, the leverage materially facilitates deals through diminished financial cost and higher net present value attainment [7]. Thirdly, the interrelation between actual and potential output is remarked as one another driver of M&A activity. Noting the neoclassical position, we will rather underscore the explication of another rationale for mergers and acquisitions being the obtainment of capacity, imperative for the operations development in the period of overall optimism [8].

Another subfield, which came under extensive review, is the theoretical rationale underlying the M&A transactions as a corporate instrument. On the one side, some academicians described the market timing theory, which posits that market participants might erroneously evaluate company shares — an oversight, opportunistic executives may take advantage of through buyout of rivals with mediocre valuation utilizing their own overvalued shares (especially in pure stock-for-stock deals) [9, 10]. On the other side, dissenting scholars lay out industry shock theory. It asserts that M&A activity shifts occur in the events of sweeping industrial, legal and technological transformations [11]. Alternative theory covered by the authors is q-theory, which implies that incompetent managers are demoted or dismissed by skilled ones through mergers and acquisitions process. Alternatively, other researchers developed unorthodox theory (in the matter of two previous), which purports that certain transactions are driven by more personal interests. The major one that was selected is “empire building”, translating in buying companies beyond the reasonable limits or need of the firm. This destroys the value for shareholders and results in unnecessary expenditures and buyer’s remorse [12]. At the same time, the rationale to be accounted for bidder in a rallying interest, according to the work of Kiymaz, is a financial stability as a condition to smooth business environment. Taking over another firm may provide the acquirer with necessary resources to get a firmer footing in financing company operations, reinforce leverage positions, and even more [13].

MODEL PREMISES

The phenomenon we will consider in the study may be conventionally also called “M&A waves”, describes the certain expansions and contractions in the aggregate deal values throughout the time period. We might incline to utilize this term further as a synonym to the object of our research for the purpose of scientific consistency and reader convenience. Next, the research, inter

Table 1

Explanatory Variable Specification

Symbol	Explanatory Variable	Dimension	Units	Frequency
S&P500	Return on float-adjusted Standard and Poor's 500 Index	Stock Market	per cent	Annual, Year End
DJIA	Return on price-weighted Dow Jones Industrial Average Index	Stock Market	per cent	Annual, Year End
GDP	Logarithmized change in real gross domestic product of the USA	Economic Activity	per cent	Annual, Year End
10s	10-year U.S. Treasury Notes Par Yield to Maturity	Credit Market	per cent	Annual, Average
PR	U.S. Policy rate	Credit Market	per cent	Annual, Average
CU	Capacity utilization ratio	Actual/Potential	per cent	Annual, Average

Source: compiled by authors from [15, 16] and predicated on [2–13].

alia, employ hypothesis testing considering discerning the nexus between explained and explanatory variables. Acknowledging the object of study, the explained variable is defined as annual aggregate volume of mergers and acquisition dealings in the United States of America in current US dollars (corresponding symbol is “M&A_Volume”). Besides, pursuing authenticity of findings, explanatory variable is recognized to demonstrate significance in terms of explained variable, should the probability value of standardized coefficient not surpass the confidence level of 5 per cent.

In the wake of extensive literature review, the definitive list of potential explanatory variables was compiled. Especially, several dimensions encompass two indicators to provide precise representation regarding potential over- or underestimation issues. For instance, the stock market is unveiled by two of US equity indexes, notably, S&P500 and DJIA, lest the substantial difference in calculation methodology noting free-float adjustments, just like contemporaneous changes in PR affecting exclusively long-term 10s [14]. The full specification with explanatory and explained variables is presented above (Table 1).

The further investigation is estimated to be established as examination of the relationship between annual aggregate value of mergers

and acquisitions and several factors. Given the academic background, it would appear reasonable to use cross-sectional multiple ordinary-least-square linear regression model as an instrument for upcoming discoveries. The general form of multiple regression equation is defined as:

$$Y_i = a_0 + \sum_{k=1}^n a_n x_{ik} + \varepsilon_i, \quad (1)$$

where: Y_i — explained variable for i -th observation;

x_{ik} — explanatory variables for i -th observation;

a_0 — constant term;

a_n — slope coefficient for explanatory variable;

ε_i — disturbance term.

Ultimately, the following set of hypotheses was created with a focus on further investigation, according reference to previous studies analyzed and conventional wisdom (Table 2).

MODEL CONSTRUCTION

The analyzed sample incorporates the annual monetary volumes of mergers and acquisitions transactions, which eighter were transpired in the United States of America or by one of the U.S. firms were involved. The data acquired relates to the events of study period, specifically, within 1985 and 2021 (Table 3). It provides us with possibility to observe the high-level sensitivity of mergers and acquisitions activity

Table 2

Hypotheses Representation

H1. There is a negative association between M&A_Volume and S&P500 variables.
H2. There is a negative association between M&A_Volume and DJIA variables.
H3. There is a positive association between M&A_Volume and GDP variables.
H4. There is a negative association between M&A_Volume and 10s variables.
H5. There is a positive association between M&A_Volume and PR variables.
H6. There is a positive association between M&A_Volume and CU variables.

Source: Prepared by authors and predicated on [2–13].

to developments in the national economy, with values edging up with the periods of economic prosperity, and repeatedly falling in time of economic downturns (e.g. 2001 crisis, Great Resection, 2020 COVID turmoil, etc.).

Most notably, this very study follows the postulate to perform initial dissection of draws obtained. This is majorly manifested in preferential construction of bivariate correlation matrix for the explanatory variables. Described technique is seen as suitable, due to the limited number of observations and variables engaged in the study, offsetting the risk of omitting valuable relationships [18]. Besides, this instruments aids in else area – to explore of the potential issue of multicollinearity between variables. Considering assessment of correlation magnitude, the procedure to categorize them was established. Namely, association is perceived to be insignificant, provided that the absolute value of Spearman correlation coefficient is less than 0.4; moderate – greater or equal than 0.4, but less than 0.6; strong – greater or equal than 0.6, but less than 0.8; very strong – greater or equal 0.8. Inherently, diagonal values consistently and unambiguously imply the perfect correlation, thus they will not receive special consideration (see *Table 4*).

As can be noted, the one pair of explanatory variables showed extremely high level of correlation (S&P500 and DJIA), whilst the same

Table 3

Initial Data for M&A_Volume Variable

Year	M&A_Volume	Year	M&A_Volume
1985	305.6	2003	668.9
1986	353.5	2004	1,006.4
1987	373.2	2005	1,342.1
1988	586.1	2006	1,843.9
1989	466.1	2007	1,967.1
1990	254.2	2008	1,215.1
1991	177.0	2009	877.6
1992	185.1	2010	981.8
1993	317.6	2011	1,247.0
1994	414.7	2012	995.7
1995	666.6	2013	1,214.8
1996	750.4	2014	2,153.8
1997	1,116.2	2015	2,417.4
1998	1,816.4	2016	1,784.8
1999	2,138.2	2017	1,761.5
2000	1,965.8	2018	1,931.8
2001	1,010.6	2019	1,883.0
2002	520.5	2020	1,172.2

Source: Authors compiled from [17].

Note: Deal values are presented in million US dollars to avoid the bias of different orders of magnitude.

number depicted strong nexus (10s and CU, PR and CU). We may wish to go into further details on this issue in future works, shall any pair make to the final list of explanatory variables.

The hypothesis testing method assumes that certain theses may be inconsequential, resulting in potential explanatory variables if not to bias other coefficients, then provide with no insightful information, being entered into the model. By calculating p-values of the regression coefficients, the meaningful explanatory variables can be decoupled from the original list. However, the size effect has a potential to distort the results of significance treatment, requiring to employ the beta weights [20] (*Table 5*). To account for this, the original dataset was transformed to standardize the explanatory variables.

After careful considerations and with the reference to the preceding established level of confidence, the intercept and merely three of six explanatory variables proved to be meaningful. Hence, there is ample proof to reject certain prior formulated hypotheses: H1, H2, and H6. Low impact of equity market conditions might be deciphered via the notion of M&A_Volume has been explanatory variable for S&P500 and DJIA, since the upcoming news and the results of transactions heavily alter the sentiments and financial position of firms, not vice versa [19]. Noting capitalization utilization, it seems to be isolated from the M&A and rather reflects the general macroeconomic environment. The further exploration is not intended to make allowance for otherwise variables, besides GDP, 10s and PR.

Finally, the initial database is adapted to the prevailing conclusions of explanatory variables analysis. The results of regression analysis are summarized (*Table 6*). Against this backdrop, all values proved to be significant, considering the critical value of t-test as 1.694.

GAUSS-MARKOVITZ THEOREM, ADEQUACY TESTING

Constructing our regression equation, it is convention to assume the Gauss-Markovitz theorem application ("G-M theory" henceforth for convenience purposes). Essentially, it formulates the ordinary least square to be the best linear unbiased estimator, provided residuals are uncorrelated, enfranchises homoscedasticity, and show expected value equaling zero [21].

Hence, some will find beneficial to present the results of the investigation in the following manner:

$$\left\{ \begin{array}{l} \overline{MA_Volume}_t = 1,965.17 + 9,857.95 * GDP_t + 25,674.84 * PR_t - 39,948.38 * 10s_t + \varepsilon_t \\ (165.83) \quad (4,447.52) \quad (6,098.92) \quad (5,674.00) \quad (414.11) \\ E(GDP_t) = E(PR_t) = E(10s_t) = 0 \rightarrow GM \text{ first premise} \\ Var(GDP_t) = const; Var(PR_t) = const; Var(10s_t) = const \rightarrow GM \text{ second premise} \end{array} \right. \quad (2)$$

Elaborating on the findings, the yield on 10-year Treasury bills is the principal contributor to variations in the aggregate annual volume of M&A transactions. As empirical explanation for the phenomenon shall serve the active exposure of the dealings to borrowed funds: circa 15% of all syndicated loan facilities in the United States were an issue in connection with takeovers on the time horizon of 1986–2003 [22]. In similar fashion, another peculiar characteristic of the 10s coefficient is explicated: inverse relationship with the explained variable. Policy rate is found to be positively correlated, opening the window of opportunity for the investors to go bottom fishing for firms in precarious circumstances. The GDP reported the largest p-value, essentially meaning the highest likelihood of results occurring under conjecture. Along with this, adjusted R^2 shows 61.5% of variance in the explained variable is

Table 4

Bivariate Correlation Matrix

	M&A_Volume	S&P500	DJIA	GDP	10s	PR	CU
M&A_Volume	1						
S&P500	(.057)	1					
DJIA	(.101)	.953[a]	1				
GDP	(.049)	.417[c]	.471[c]	1			
10s	(.639)[b]	.090	.179	.423[c]	1		
PR	.313	.160	.237	.379	.669[b]	1	
CU	(.138)	.118	.162	.541[c]	.657[b]	.747[b]	1

Source: Compiled by authors from [15, 16].

Note: The table reports Spearman correlation coefficients for the figures, given in Table 4. The [a], [b], and [c] terms indicate the very strong, strong, and moderate association, respectively.

Table 5

Explanatory Variables Analysis

	Beta Weights	Standard Error	t Stat	P-value	Significance
Intercept	1107.85	61.99	17.87	0.000	Yes
S&P500	– 122.31	215.71	– 0.57	0.575	No
DJIA	– 22.90	223.51	– 0.10	0.919	No
GDP	227.26	88.63	2.56	0.016	Yes
10s	– 1116.25	133.56	– 8.36	0.000	Yes
PR	675.94	152.74	4.43	0.000	Yes
CU	32.06	108.38	0.30	0.769	No

Source: Prepared by authors on [15, 16].

Table 6

Results of Regression Analysis

	Intercept	GDP	PR	10s
Coefficients	1,965.166	9,587.955	25,674.84	– 39,948.382
Standard Error	165.828	4,447.518	6,098.916	5,674.003
t Stat	11.850	2.156	4.209739	– 7.040
P-value	0.000	0.039	0.000	0.000
Multiple R	0.805			
R Square	0.648			
Adjusted R Square	0.615			
Standard Error	414.113			
F	19.665*			

Source: Prepared by authors and predicated on [15, 16].

Note: * – p-value < .01.

Table 7

Residual output

No.	Predicted	Residuals
1	(244.88)	550.52
2	1,203.58	(850.04)
3	496.78	(123.61)
4	385.18	200.87
5	614.39	(148.30)
6	400.13	(145.97)
7	335.70	(158.71)
8	419.85	(234.72)
9	640.46	(322.85)
10	450.68	(35.98)
11	888.68	(222.10)
12	1,105.28	(354.89)
13	1,142.46	(26.24)
14	1,593.86	222.55
15	1,356.70	781.48
16	1,306.29	659.52
17	851.63	158.95
18	615.72	(95.18)
Average 0.00		0.00 0.00
19	1,315.29	(646.43)
20	1,196.25	(189.83)
21	1,628.54	(286.44)
22	1,843.62	0.27
23	1,809.74	157.32
24	815.78	399.31
25	799.05	78.56
26	1,133.40	(151.60)
27	1,193.16	53.88
28	1,588.81	(593.16)
29	1,461.71	(246.92)
30	1,388.85	764.95
31	1,487.92	929.47
32	1,684.37	100.40
33	1,712.17	49.37
34	1,656.34	275.47
35	2,062.68	(179.70)
36	1542.43	(370.20)
Average		0.00

Source: Prepared by authors and predicated on [15, 16].

Table 8

Results of Goldfeld-Quandt Test

Category	Upper Set	Lower Set
Size	12	12
Residual SS	1,840,879.43	2,076,646.74
GQ statistic	1.128	
F crit (5%)	3.438	

Source: Compiled by authors.

Note: The GQ statistic was derived by dividing the larger of two Residual SS by the smaller one. The fact that FQ statistic is lower than F crit (5%) indicates homoscedasticity.

illustrated by explanatory variables through a linear regression model, while F-statistic evidences that adjusted R^2 reading holds non-random and the model specification quality is high.

Admittedly, acceptance of G-M theory “as it is” requires further test of validity. Thus, for the purpose named several tests were administered to refute or confirm priorly stated assertions, notably: average of residuals, Goldfeld-Quandt test, along with Durbin Watson. For the former, the predicted and observed values for each period were juxtaposed to derive the variance between them. Afterwards, the simple arithmetic mean of variances was calculated for the entire residual universe. The following sets forth the readings obtained. Since calculated simple average resulted in 0, the 1st premise of G-M theory in the matter of our model is affirmed (Table 7).

The Goldfeld-Quandt test was conducted following a universally recognized scheme of division sum-of-squares statistics for last and first out of three equal subsets¹. These, in their place, were obtained by ranking the initial dataset, utilizing the factor of sum of independent variable values as a criterion. Subsequently, the F-test critical value for 5% per cent confidence level was computed and collated with statistic value. We

¹ Kennedy P.A. Guide to Econometrics: textbook. Malden, MA: Blackwell Publishing; 2008. 603 p.

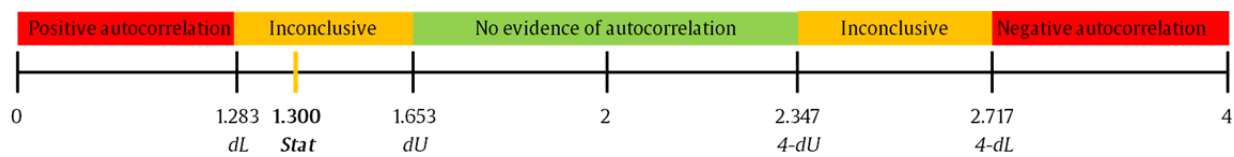


Fig. 1. Durbin-Watson Critical Regions

Source: Prepared by authors and predicated on [15, 16].



Fig. 2. Adequacy Test Analysis

Source: Prepared by authors and predicated on [15, 16].

would accept the homoscedasticity of residuals, should the statistic be lower than the critical value. The results of the test are set forth, again reinforcing applicability of G-M theory in terms of the data universe collected (*Table 8*).

Lastly, the Durbin-Watson was run to uncover the existence or absence of autocorrelation. The statistic computed was collated with the upper and lower limits for the sample with 3 explanatory variables and 5% critical level. In the aftermath, the *Fig. 1* illustrates the inconclusiveness of the outcomes, i.e. we have no justification to either identify or rebut the occurrence of autocorrelation [23].

Henceforth, we may suggest that the first 2 premises of G-M theory are fulfilled with no need to reject or accept the 3rd premise. Overall, the model satisfies the G-W theory. Thus, we have proved that the OLS-estimates of the coefficients of the linear regression model are unbiased, consistent, and effective.

Separately, the challenge of adequacy is a prerequisite for further conclusions to be made, owing to the fact that up to this point we have no foundation to state the forecast accuracy of the model to be satisfactory. First, we used our value from the time period 2021 (*Table 7*) as an empirical data to commence the investigation. Then, we took the two-tailed t-statistic for commensurate degrees of freedom multiplied by the standard error of regression [value – 843.52]. Next, the range was computed as the two-side corridor with the observed value in the middle [1244.29:2931.32]. Ultimately, the predicted value of the candidate model transpired within the limits of aforementioned corridor, resulting in conclusion of model adequacy (*Fig. 2*).

CONCLUSIONS

To draw a conclusion, in the capacity of conservative estimate, three contributions

emerge from the comprehensive analysis performed within current work. For one, granted that mergers and acquisitions are regarded as multidisciplinary activity, we consolidated, summarized, and integrated extensive list of explanatory variables, namely: annual returns in Standard and Poor's 500 alongside Dow Jones Industrial Average Indices, annual change in real gross domestic product, 10-year U.S. Treasury notes yield to maturity, policy rate, and, finally, capacity utilization ratio. Second of all, the research underscores that in the matter of U.S. market of 1985–2020, the stock returns and capital utilization did not report sufficient indications of explaining the M&A volumes. This could be perchance explained by reverse relationship and feeble connections with factor, respectively. In the third place, we summarized and determined the key drivers of M&A activity in the United States owing yield on 10-year Treasury notes

to have the heaviest impact on the explanatory variables.

Further investigation directions may include more extensive set of variables to be tested upon their significance, considering stock performance in more nuanced way. Further, the issue of not being able to accept nor deny third Gauss – Markovitz theorem in current work might be a captivating field of research, employing more deep autocorrelation tools to unravel the state of things. Another significant future contribution may be derived by cross-checking of the results obtained by alternative methodology.

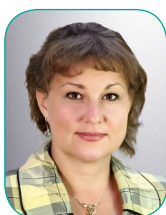
Special mention should be made of the fact that since our paper is a practically oriented examination of merger and acquisition activity in the United States, we believe the research to possess certain ability to be used as a compelling argument in the matter of advising corporate clients about strategic opportunities and undertaking management decisions of corporations.

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ABOUT THE AUTHORS



Ilona V. Tregub — Dr. Sci. (Econ), Professor, Professor of the Department of Mathematics Financial University, Moscow, Russia
<https://orcid.org/0000-0001-7329-8344>
 itregub@fa.ru



Artem F. Butyrskiy — 3-year student, Department of International Economic Relations, Financial University, Moscow, Russia
<https://orcid.org/0000-0002-1112-6253>
 202163@edu.fa.ru

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