

TRADE DEFICIT NEWS, SYSTEMATIC RISK AND THE CRASH OF 1987

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INTRODUCTION

Trade deficits exceeding \$100 billion emerged in 1984. As Krugman [1990] discussed, these unprecedented trade deficits were produced by declines in household savings combined with increases in structural budget deficits. Aggarwal and Schirm [1992] demonstrated that financial markets began paying attention to trade-deficit news in the mid-1980s. They showed that news of a \$1 billion unexpected increase in the aggregate trade deficit lowered the Dow Jones Industrial Average (DJIA) by 0.17 percent over the October 1985-December 1988 period. They argued that it would be interesting to investigate whether the trade deficit was an underlying source of risk to the economy during this period.

Modern financial theory [Ross, 1987] emphasizes that the relevant risks affecting asset returns are economy-wide or systematic factors. An asset must pay a premium to compensate for its exposure to systematic risk. In contrast, no premium is necessary to compensate for idiosyncratic or industry-specific risk. Rather, this risk can be diversified away in large portfolios.

There are several reasons why the U.S. trade deficits in the mid-1980s, which exceeded \$100 billion per year, might have been a source of systematic risk affecting asset returns. First, an increase in the trade deficit might have implied a drop in demand for U.S. goods and thus in the cash flow of U.S. companies.¹ Second, a larger trade deficit might have caused investors to expect protectionism. Krugman [1990], for instance, has mentioned that public apprehension over the trade deficit led to the protectionist aspects of the 1988 Trade Act. Third, the trade deficit might ultimately have raised the price of foreign goods and caused inflation. Many have demonstrated that inflation affects stock prices. Fourth, to finance these massive deficits foreigners had to hold more and more U.S. stocks and bonds. According to the principle of portfolio diversification they would have become increasingly reluctant to allocate additional wealth into dollar assets. Thus, because the trade deficit forced foreigners to hold more dollars, it might have raised the risk premium on U.S. assets. Fifth, as the Presidential Task Force on Market Mechanisms [Brady, 1988] (henceforth Brady Commission) discussed, news of higher trade deficits depreciated the dollar, raised interest rates, and increased fear among U.S. investors that foreign investors would sell dollar-denominated stocks. For all these reasons news of large trade deficits could have increased the perception of the systematic risk in holding U.S. equities.

Evidence that the trade deficit was a source of risk to the economy from 1984 to 1988 would be interesting because this period includes the October 1987 stock market crash. Caves, Frankel, and Jones [1990], the Brady Commission [1988], and Shiller [1990] all have discussed the hypothesis that news of the trade deficit could have triggered this collapse. News that the merchandise trade deficit was \$1.5 billion greater-than-expected was released just before the stock market opened on 14 October 1987 [the *Wall Street Journal*, 15 October 1987]. The dollar immediately fell 1 percent against the yen and the DJIA fell 95 points that day, beginning the 800 point drop that occurred over the next five days.² Caves, Frankel, and Jones argued that news of the trade deficit might have lowered the dollar and the DJIA either because it implied a drop in demand for U.S. goods or because investors became satiated with holding dollars and demanded a risk premium to hold more U.S. assets. The Brady Commission argued that trade deficit news lowered stock prices because it heightened fear among U.S. investors that foreign investors would sell dollar-denominated assets. The Brady Commission further argued that the initial price decline on October 14th due to trade deficit news sparked a cascade effect, with portfolio insurance prompting institutional investors to sell, and thus triggered the further declines over the next five days.³ Shiller [1990] found using survey methods that excessive indebtedness, a theme related to the trade deficit, was the news item most often volunteered by investors as being on their minds during the week of the crash.

Evidence that the trade deficit was a source of systematic risk makes it more plausible that news about it triggered the 95 point drop in the DJIA on October 14th which began the 30 percent decline in share values over the next five days. If the trade deficit were not a priced risk factor, news of a \$1.5 billion unexpected change in the trade deficit should be a minor event (by the estimates of Aggarwal and Schirm [1992], one would expect the DJIA to fall by 7 points). However, evidence that the trade deficit is a systematic source of risk suggests a channel through which it could have played a greater role. Commentators such as Leland and Rubinstein [1988] and the Brady Commission [1988] have demonstrated that perceptions of the riskiness of stock returns (as measured, for instance, by the *ex ante* standard deviation implicit in stock option prices) increased dramatically during this time. Pindyck [1986] has presented evidence that an increase in the variance of an asset's price reduces its return. Thus, trade-deficit news might have increased agents' perceptions of the riskiness of holding stocks and thereby triggered a large drop in their prices.

To test whether the trade deficit was a systematic source of risk to equities, this paper uses the Arbitrage Pricing Theory (APT). The APT implies that an asset must pay a premium to compensate for its exposure to systematic economic factors but not for its exposure to idiosyncratic or industry-specific factors. It provides a robust framework for testing whether a variable is a systematic economic factor since, as Ross [1987, 329] has argued, the APT is a "... snapshot of any intertemporal model in which the factors represent innovations in the underlying state variables." The results presented here indicate that the trade deficit is a priced factor in the APT and that unexpected increases in the trade deficit lower stock returns.

The next section discusses the data and methodology used to investigate whether the trade deficit is a factor in the APT. This is followed by a presentation of the empirical results and by concluding comments.

DATA AND METHODOLOGY

In the APT framework, the *ex ante* required return on an asset i will depend on its exposure to several macroeconomic factors and on the risk premia associated with these factors:

$$(1) \quad E_i = \lambda_0 + \sum_j \lambda_j \beta_{ij}$$

where E_i is the *ex ante* return on asset i , λ_0 is the risk-free rate, λ_j is the risk premium associated with factor j , and β_{ij} measures the exposure of asset i to factor j . *Ex post* returns will also depend on unexpected changes in both macroeconomic and industry-specific factors:

$$(2) \quad R_i = E_i + \beta_{ij} f_j + \epsilon_i$$

where R_i is the *ex post* return on asset i , f_j is the unexpected change in macroeconomic factor j , ϵ_i is a mean-zero error term capturing the effects of industry-specific influences on R_i , and the other variables are as defined in equation (1). Combining equations (1) and (2) yields

$$(3) \quad R_i - \lambda_0 = \sum_j \beta_{ij} (f_j + \lambda_j) + \epsilon_i$$

McElroy and Burmeister [1988] have shown that the λ_j 's and β_{ij} 's in this equation can be estimated using a nonlinear seemingly unrelated regression technique.⁴ The resulting estimates are strongly consistent and asymptotically normally distributed. Their approach is used here to test whether the trade deficit is a systematic risk factor that influences asset prices.

When testing whether a variable is a priced risk factor one must use the unanticipated movement in that variable. Forward-looking investors already will have incorporated the effects of previously anticipated changes into asset prices. Apart from unexpected changes in the trade deficit, the same factors that Chen, Roll, and Ross [1986] used (the default premium, the horizon premium, the growth rate of industrial production, unexpected inflation, and the change in expected inflation) are employed here. They argued that each of these series is nearly serially uncorrelated. For each variable this implies that the current month's realization is unpredictable given past information on the variable. Thus Chen, Roll, and Ross argued that the current month's realization could be treated entirely as an unanticipated movement in the variable.

These factors were calculated in the same way that Chen, Roll, and Ross calculated them. The default premium is the difference between total returns on corporate bonds and Treasury bonds and the horizon premium is the difference between total returns on Treasury bonds and Treasury bills. Data on these were obtained from Ibbotson Associates [1990]. The growth rate of industrial production (IP) was calculated as the change in the logarithm of IP. Data on IP were obtained from the Citibase data tape. To find expected inflation, the expected real rate of return on a one-month Treasury bill was first calculated using the method of Fama and Gibbons [1984]. This was subtracted from the nominal one-month Treasury bill rate, which was already known to investors, to calculate expected inflation. Unexpected inflation was then defined as the difference between actual inflation and expected inflation. Data on inflation and one-month Treasury bill returns were also taken from Ibbotson Associates.

Since the focus of this paper is the trade deficit, an attempt was made to calculate its unanticipated changes in several ways. As Leamer [1983] has argued, empirical results are only believable if they can be demonstrated to be robust to variations in specification. As a first specification, the following autoregressive-moving average model was fit to the merchandise trade deficit (*MTD*):

$$(4) \quad MTD = 0.24 + 0.52MTD_{-1} + 0.47MTD_{-2} + e - 0.18e_{-1} - 0.25e_{-2}.$$

$$R^2=0.88, Q\text{-Statistic (15 lags)}=12.3, \text{ Sample Period} = 80:01\text{-}88:12$$

This model would be appropriate if investors used a univariate time-series model to forecast *MTD*. The residuals from this model were used as one estimate of the unexpected changes in the trade deficit. As a second specification, a prediction equation was estimated with the trade deficit regressed on four lags each of the trade deficit, the unemployment rate, and the trade-weighted exchange rate from 1980:01 through 1988:12. This model would be appropriate if investors used not only lagged trade deficits but also lagged values of other economically relevant variables to predict *MTD*. The R^2 from this regression was 0.90. The residuals from this regression were used as a second estimate of unanticipated movements in the trade deficit. Finally, unanticipated movements in *MTD* were measured by taking the first difference of the trade deficit. This model would be appropriate if investors believed that the trade deficit followed a random walk. Data on *MTD* were obtained from the *Economic Report of the President*.

Total returns on 43 portfolios were employed here. These portfolios were chosen with a view to spreading expected returns over a wide range. As Chen, Roll, and Ross [1986] argued, doing this would improve the discriminatory power of the statistical tests. The portfolio data were assembled by the author from the Standard & Poors' *Security Price Index Record* and from Ibbotson Associates [1990]. Following McElroy and Burmeister [1988] the return on one-month Treasury bills (obtained from Ibbotson Associates) was used as the risk-free rate and subtracted from each portfolio return before estimation.

TABLE 1
Estimates of the Risk Premia on Macroeconomic Factors^a

Factor	Method of Estimating Trade Deficit News ^b		
	MVAR	FDIF	ARMA
Trade Deficit	0.38** (1.91)	1.27* (3.32)	0.46* (2.23)
Horizon Premium	-0.01 (-0.03)	-0.16 (-0.61)	0.02 (0.11)
Default Premium	-0.10 (-0.62)	0.11 (0.59)	-0.07 (-0.44)
Unexpected Inflation	0.004 (0.17)	0.03 (1.28)	0.003 (0.14)
Change in Expected Inflation	-0.01 (-1.16)	-0.02** (-1.80)	-0.01 (-1.02)
Growth in Industrial Production	0.01 (0.23)	-0.003 (-0.05)	0.004 (0.07)

^a The sample period is 1984:1 to 1988:12 and each of the 43 equations has 54 degrees of freedom. *t*-statistics in parentheses.

^b MVAR = residuals from a multivariate autoregression, FDIF = first difference of trade deficit series, ARMA = residuals from an autoregressive-moving average model.

*, ** Indicates significance at 5 percent and 10 percent levels, respectively.

The estimation was performed from 1984:01 through 1988:12, which was the period over which previous authors found that the trade deficit had the largest effect on asset prices. Each of the 43 estimated equations had 54 degrees of freedom.

RESULTS

Table 1 presents estimates of the risk premia (the λ_j 's) associated with the trade deficit for the three different specifications. In two of the three cases, the risk premium associated with the trade deficit is significant at the 5 percent level and in the third, at the 10 percent level. This provides strong evidence that the trade deficit is a priced risk factor in the APT. Taking the average of the three values, these results indicate that an asset which is perfectly correlated with the trade deficit must pay a premium of 0.70 percent. Contrary to the findings of Chen, Roll, and Ross [1986], however, there is little evidence that the other factors are systematic sources of risk over the 1984-1988 period. This perhaps indicates that financial markets were focussing on news of the trade deficit over this period.

Table 2 presents estimates of the exposures (the β_j 's) associated with the trade deficit for the three different specifications. Out of 129 coefficients, 127 are nega-

tive, 46 are negative and significant at the 10 percent level or better, and 25 are negative and significant at the 5 percent level or better. This provides firm evidence that unexpected increases in the trade deficit lower stock prices. Taking the average of the 129 coefficients, a \$1 billion unexpected increase in the trade deficit would lower stock returns by 0.53 percent.

There were twelve portfolios for which the average exposure for the three specifications exceeded (in absolute value) 1.0 percent. These were aluminum, electronics (semiconductors), household furnishings, leisure, machine tools, miscellaneous metals, office equipment, hotel, low-priced common stock, financial (life insurance), financial (savings and loans), and homebuilding. Of these twelve portfolios seven represent industries in which imports and exports are important (aluminum, semiconductors, household furnishings, leisure, machine tools, miscellaneous metals, and office equipment) and three represent interest-sensitive industries (life-insurance, savings and loans, and homebuilding). The large effect on the first set of industries probably reflects the influence of the trade deficit on the cash flow of U.S. companies that McQueen and Roley [1990] discussed. The large effect on the second set of industries probably reflects the impact of trade deficit news on interest rates that the Brady Commission [1988] discussed.

The important implication of the results presented here is that the trade deficit is a systematic source of risk to the economy and that unexpected increases in the trade deficit lower stock prices. This is consistent with the hypothesis that news of the trade deficit on 14 October 1987 increased agents' perceptions of the riskiness of holding equities and triggered the 800 point decline in the DJIA that occurred over the next five days. The results also imply that policymakers need to take into account the effects on financial markets when considering policies that affect the trade deficit.⁵

CONCLUSION

Trade deficits exceeding \$100 billion began attracting the attention of market participants in the mid-1980s. Several observers have suggested that news of a larger than expected trade deficit precipitated the October 1987 stock market crash. This argument would be more compelling if the trade deficit were a source of systematic risk, since then trade deficit news could have contributed to the increased perception of the riskiness of holding equities that the Brady Commission [1988] documented just before the crash. This paper uses the Arbitrage Pricing Theory to demonstrate that the trade deficit was a source of systematic risk and that unexpected increases in the trade deficit reduced equity returns. This supports the hypothesis that trade deficit news played a role in triggering the \$1 trillion decline in the value of U.S. stocks that occurred between October 14th and 19th, 1987.

TABLE 2
The Exposure of Portfolio Returns to Trade Deficit News^a

Portfolio	MVAR	Method of Estimating Trade Deficit News ^b	
		FDIF	ARMA
Aluminum	1.48* (-1.96)	-1.13* (-2.11)	-1.59* (-2.37)
Automobiles	-1.07** (-1.79)	-0.59 (-1.38)	-1.11* (-2.08)
Chemicals	-0.61 (-1.07)	-0.64 (-1.61)	-0.70 (-1.38)
Cosmetics	-0.83 (-1.53)	-0.72** (-1.87)	-0.87** (-1.82)
Drugs	-0.42 (-0.94)	-0.23 (-0.72)	-0.42 (-1.05)
Electronics (instrumentation)	-1.03 (-1.42)	-0.61 (-1.18)	-1.00 (-1.54)
Electronics (semiconductors)	-1.27 (-1.38)	-0.79 (-1.22)	-1.10 (-1.33)
Entertainment	-0.68 (-1.01)	-0.16 (-0.33)	-0.62 (-1.02)
Financial (life insurance)	-1.05* (-2.20)	-0.97* (-2.95)	-1.09* (-2.56)
Financial (multi- line insurance)	-0.57 (-0.98)	-0.36 (-0.86)	-0.39 (-0.75)
Financial (personal loan companies)	-0.86 (-1.15)	-0.92** (-1.74)	-0.99 (-1.47)
Financial (property casualty insurance)	-0.58 (-1.22)	-0.58** (-1.75)	-0.51 (-1.18)
Financial (savings & loan)	-1.20** (-1.72)	-0.66 (-1.31)	-1.37* (-2.21)
Food	-0.17 (-0.35)	-0.07 (-0.20)	-0.22 (-0.49)
High grade common stocks	-0.14 (-0.34)	0.05 (0.16)	-0.19 (-0.50)
Homebuilding	-1.36** (-1.88)	-0.83 (-1.60)	-1.38* (-2.13)
Hotel	-1.41* (-2.50)	-0.63 (-1.50)	-1.22* (-2.38)

TABLE 2 (Cont.)
The Exposure of Portfolio Returns to Trade Deficit News^a

Portfolio	Method of Estimating Trade Deficit News ^b		
	MVAR	FDIF	ARMA
Household furnishings	-1.14** (-1.73)	-0.73 (-1.54)	-1.24* (-2.12)
Leisure	-1.66** (-1.85)	-0.76 (-1.17)	-1.48** (-1.83)
Low priced common stocks	-1.16* (-2.01)	-0.84* (-2.04)	-1.26* (-2.45)
Machine tools	-1.71** (-1.94)	-0.97 (-1.53)	-1.80* (-2.30)
Metals, miscellaneous	-0.96 (-1.01)	-0.96 (-1.43)	-1.25 (-1.47)
Money center banks	-1.06** (-1.78)	-0.71** (-1.65)	-1.04** (-1.94)
Office equipment	-1.00 (-1.52)	-0.99* (-2.17)	-1.19* (-2.05)
Oil	-0.57 (-1.32)	-0.38 (-1.24)	-0.54 (-1.38)
Paper	-0.85 (-1.45)	-0.84* (-2.07)	-0.88** (-1.69)
Pollution control	-0.29 (-0.43)	-0.50 (-1.05)	-0.62 (-1.02)
Publishing	-0.46 (-0.90)	-0.40 (-0.77)	-0.72 (-1.12)
Publishing (newspapers)	-0.62 (-1.00)	-0.43 (-0.98)	-0.61 (-1.08)
Restaurants	-0.45 (-0.94)	-0.21 (-0.60)	-0.38 (-0.87)
Retail stores (department stores)	-0.78 (-1.18)	-0.42 (-0.90)	-0.83 (-1.40)
Retail stores (drug stores)	-0.94** (-1.73)	-0.82* (-2.01)	-1.16* (-2.30)
Retail store (general merchandise)	-0.34 (-0.56)	-0.30 (-0.69)	-0.48 (-0.89)
Retail stores (food chain)	-0.79 (-1.22)	-0.47 (-1.02)	-0.86 (-1.48)

TABLE 2 (Cont.)
The Exposure of Portfolio Returns to Trade Deficit News^a

Portfolio	Method of Estimating Trade Deficit News ^b		
	MVAR	FDIF	ARMA
Shoes	-0.81 (-1.16)	-0.39 (-0.78)	-0.79 (-1.26)
Small company stocks	-0.93* (-2.10)	-0.61* (-1.93)	-0.95* (-2.42)
Textiles (apparel)	-0.71 (-1.05)	-0.56 (-1.15)	-0.79 (-1.28)
Tobacco	0.11 (0.61)	-0.05 (-0.13)	-0.23 (-0.42)
Toys	-1.13 (-1.33)	-0.90 (-1.50)	-0.92 (-1.20)
Transportation (air transport)	-1.05 (-1.58)	-0.82** (-1.74)	-1.06** (-1.77)
Transportation (railroads)	-0.94** (-1.68)	-0.85* (-2.13)	-0.99* (-1.98)
Transportation (truckers)	-0.88 (-1.29)	-0.90** (-1.87)	-0.99 (-1.62)
Utility companies	-0.25 (-0.88)	-0.32 (-1.59)	-0.32 (-1.26)

^a The sample period is 1984:1 to 1988:12 and each of the 43 equations has 54 degrees of freedom. *t*-statistics appear in parentheses.

^b MVAR = residuals from a multivariate autoregression, FDIF = first difference of trade deficit series. ARMA = residuals from an autoregressive-moving average model.

*, ** Indicates significance at 5 percent and 10 percent levels, respectively.

NOTES

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1. The first three hypotheses are discussed by McQueen and Roley [1990].
2. Both the *Wall Street Journal* and the Brady Commission argued that the trade deficit announcement on 14 October 1987 was higher-than-anticipated. Confirmation that the announcement was higher-than-expected came from the instantaneous response of the dollar and the DJIA to the news. If the announcement were largely anticipated investors would have already discounted the news and would not have immediately bid down stock prices and the dollar.
3. The Brady Commission [1988, v] also discussed "...proposed tax legislation which led to the collapse of the stocks of a number of takeover candidates..." as a second news item that triggered the crash. Shiller [1988], however, found that only 3 out of 889 investors surveyed immediately after the crash mentioned this news story as the one triggering the crash.
4. This technique jointly estimates a system composed of equations such as equation (3). It uses nonlinear optimization methods to do this since these equations are nonlinear in the parameters.
5. For a discussion of the relevance of these results to a reduction in the trade deficit achieved through re-investing the social security trust funds in private assets, see Thorbecke [1992].

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