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THE GREAT CRASH AND THE ONSET OF THE GREAT DEPRESSION

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ABSTRACT

This paper argues that the collapse of stock prices in October 1929 generated temporary uncertainty about future income which caused consumers to forego purchases of durable and semidurable goods in late 1929 and much of 1930. Evidence that the stock market crash generated uncertainty is provided by the decline in confidence expressed by contemporary forecasters. Evidence that this uncertainty affected consumer behavior is provided by the fact that spending on consumer durables and semidurables declined immediately following the Great Crash and by the fact that there is a negative historical relationship between stock market variability and the production of consumer durables in the prewar era.

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"Uncertainty is worse than knowing the truth, no matter how bad."

(The Magazine of Wall Street, November 30, 1929, p. 177)

INTRODUCTION

In the mind of the average person the Great Crash and the Great Depression are often considered to be the same event. The decline in stock prices in October 1929 and the tremendous decline in real output between 1929 and 1933 are often thought of as part of the same cataclysmic decline of the American economy. In contrast, in the minds of many economists the two events are not only not synonymous, they are in fact only tangentially related. Dornbusch and Fischer (1984), for example, stress that real output started down before stock prices collapsed and that the largest falls in output did not occur until after the banking panics of 1931.

Despite the dichotomy that economists often impose between the Great Crash and the Great Depression, it is nevertheless true that the downturn in real output that began in August 1929 accelerated dramatically after the collapse of stock prices. For example, while seasonally adjusted industrial production declined 1.8 percent between August 1929 and October 1929, it declined 9.8 percent between October 1929 and December 1929 and another 23.9 percent between December 1929 and December 1930. Furthermore, while economists have reasonably convincing stories about why output started to decline in the summer of 1929 and why it took a dramatic fall in 1931, the existing explanations for why the decline accelerated so decidedly in late 1929 and continued throughout 1930 are much less satisfactory.

This paper argues that there may in fact be a very important link between the stock market crash and the decline in real output in late 1929 and through much of 1930. That link is that the stock market crash caused consumers and producers to become uncertain about the course of future income. As a result, consumers and producers chose to delay current spending on durable and semidurable goods as they waited for further information about the likely course of economic activity. This decline in spending then drove down aggregate income through a standard Keynesian mechanism (or, conceivably, through effects on the real interest rate and the supply of labor).

The fact that an increase in particular types of uncertainty can theoretically cause an immediate drop in investment spending is discussed in detail in Bernanke (1983a). In Section I of the paper I extend Bernanke's analysis of the determinants of investment spending to the effects of uncertainty on consumer spending. I present a simple infinite horizon model of consumer behavior when there are durable and nondurable goods and when future income is temporarily uncertain. This model of consumer behavior shows that temporary uncertainty about future income can cause a pause in the purchases of durable consumption goods. I also discuss the predictions of the model when there are durable goods with varying degrees of resalability. I argue that goods for which purchases can be more easily reversed will be less affected by temporary uncertainty than those that are irreversible. I then provide reasons why one might expect a stock crash to generate temporary uncertainty about future income.

Section II of the paper examines the behavior of various disaggregate spending and production series to see if it is consistent with the model discussed in Section I. The model predicts that all types of spending on

durables and semidurables should decline drastically following the Great Crash, and that consumer spending on durables with difficult resale should decline most of all. Using various types of monthly spending data I find that sales of durables did indeed decline markedly relative to usual following the collapse of stock prices. Using annual data on the production of various types of consumption and investment goods, I also find that consumer spending on durable goods with poor resale potential (such as china, floor coverings, and household furniture) declined much more than one would otherwise predict, even controlling for the behavior of total output.

In addition to making predictions about the behavior of various spending series in 1929 and 1930, the uncertainty hypothesis also predicts that there should be a negative historical relationship between stock market variability and real consumer spending on durable goods. Using data on the annual production of various types of consumer goods, I find that there is indeed a negative relationship between consumer spending on durables and stock market volatility in the late 19th and early 20th centuries. Furthermore, I find that the negative effect of stock market variability is strong enough to account for much of the decline in real consumer spending that occurred in late 1929 and 1930.

While the behavior of sales and production is consistent with the uncertainty hypothesis, it is also important to find direct evidence on whether uncertainty increased dramatically because of the stock market crash in late 1929. In Section III I do this by examining the forecasts and analyses of five contemporary forecasters for the periods surrounding the recessions of 1921, 1924, and the stock market crash of 1929. This previously unexploited source provides a wealth of information about the

expectations and uncertainty of sophisticated financial analysts in these crucial periods and about their perception of consumer expectations and uncertainty. I find that forecasters were themselves much more uncertain following the stock market crash than was typical even for unsettled times, and more importantly, that forecasters believed that consumers and producers were unusually uncertain about the future of the economy immediately following the drastic fall in stock prices and continuing well into 1930.

This explanation for the decline in consumption in late 1929 and early 1930 may provide an important missing link in the economic history of the Great Depression. As mentioned earlier, economists have widely accepted explanations for many of the pieces of the decline in output between 1929 and 1933. Hamilton (1987) argues convincingly that monetary stringency was an important source of the initial decline in production in the late summer of 1929. Friedman and Schwartz (1963) have provided evidence that the decline in the money supply caused by the banking panics of mid-1931 depressed the economy beginning in 1931. Furthermore, Bernanke (1983b) suggests that the collapse of intermediation caused by the banking panics of 1931 provides another source of decline for the later years of the Depression.

The primary mystery surrounding the Great Depression is why output fell so drastically in late 1929 and all of 1930. Temin (1976) argues that the behavior of interest rates suggests that monetary stringency could not be the main explanation for the real decline in this period. Temin's alternative explanation is that there was a decline in spending of all sorts, and of consumption in particular. This view is fairly widely accepted (see, for example, Hamilton (1987, p. 168) and Gordon and Wilcox

(1982, pp. 70-74), though some authors such as Mayer (1978a, b) have challenged Temin's evidence on the importance of consumption.

Several studies have tried to explain the decline in spending noted by Temin. Not surprisingly, many of these explanations are related to the effects of the stock crash. Temin (1976), for example, asks whether negative expectations caused by the crash could have decreased consumers purchases. He concludes from the behavior of bond ratings that expectations were too optimistic for this to be an explanation. Mishkin (1978) asks whether the change in the household balance sheet caused by the fall of security prices can explain the fall in consumption. While his estimates suggest that the decline in wealth and the desire for liquidity can explain some of the decline in spending, they cannot account for a substantial fraction of the total fall. The failure of these explanations to account for the large fall in real spending following the Great Crash suggests that the uncertainty hypothesis could provide a useful step in explaining the mysterious first year of the Great Depression.

I. MODEL OF THE EFFECT OF TEMPORARY UNCERTAINTY

Basic Model

To evaluate how temporary uncertainty about future income affects current consumption spending, it is useful to consider a simple model of consumer decision making. The model that I present assumes that there is a representative consumer who is infinitely lived, has quadratic utility, and allocates his consumption between perishable and durable goods. The prices of both durable and perishable goods are assumed to be fixed. The model shows that a temporary increase in uncertainty depresses consumer spending.

In essence, the model shows that the aggregate demand curve for the economy shifts back in response to a temporary rise in uncertainty about future income.

Definitions. The basic setup of the model is as follows. There is one perishable good in the economy (food) and x_t is the quantity of the perishable that the consumer purchases in period t. The price of the perishable is one. There is also one durable good in the economy (a car) which lasts for N periods and then depreciates completely. The consumer chooses q_t, which is the quality of the single durable that he owns in period t. The price of the durable in the period that the consumer buys it is αq_t. Because there is no depreciation until the Nth period, a durable of quality q provides q services in each of N periods. Purchases of durables are assumed to be irreversible.

Utility is assumed to be quadratic in the two types of goods. That is,

$$U_t = x_t - \frac{1}{2} a x_t^2 + q_t - \frac{1}{2} b q_t^2 . \tag{1}$$

The consumer is assumed to live forever, so lifetime utility, U, is

$$U = \sum_{t=0}^{\infty} \left(\frac{1}{1+\delta}\right)^t U_t , \tag{2}$$

where δ is the discount rate. Lifetime wealth, W, is equal to the present discounted value of future income, Y_t. Temporary uncertainty is introduced into the model by assuming that in period 0 lifetime wealth is unknown, with mean μ and variance σ^2. In period 1 the certain value of lifetime wealth is learned. Thus, the consumer is temporarily uncertain in period 0 and the degree of uncertainty is indicated by σ^2.

The basic setup of the model should make clear that the mechanism by which uncertainty affects consumer spending in this model is different from

that in Zeldes (1986) and others, where the third derivative of the utility function is key. Because the third derivative of a quadratic utility function is obviously zero, the effects of uncertainty in this model will have to come from the irreversibility of durable purchases and the temporary nature of the uncertainty.

To make the model more tractable I make several simplifying assumptions. First, I assume that the interest rate (r) is constant and equal to the discount rate (δ). Second, I assume that the coefficients a and b of the utility function are equal. I also assume that the price (per unit of quality) of the durable good is

$$(3) \qquad \alpha = 1 + \left(\frac{1}{1+r}\right) + \left(\frac{1}{1+r}\right)^2 + \ldots + \left(\frac{1}{1+r}\right)^{N-1}$$

$$= \frac{1+r}{r}\left[1 - \left(\frac{1}{1+r}\right)^N\right].$$

These assumptions ensure that under certainty the quantity of the nondurable that the consumer buys (x_t) and the service flow of the durable that the consumer owns (q_t) will be constant and equal to one another.

Analysis. To analyze how an increase in uncertainty in period 0 affects a consumer's spending decision I calculate the expected lifetime utility of the representative consumer both under the assumption that he does not buy a durable in period 0 and under the assumption that he does buy a durable in period 0. I then see how the difference between these two expected utilities is affected by an increase in the variance of the present discounted value of lifetime income, σ^2. Because utility is quadratic, calculating the expected lifetime utilities under the two scenarios is straightforward.

One can show that if the consumer does not buy a durable good in period 0, then

(4) $$x_0 = \frac{r\mu}{2+r}, \text{ and}$$

(5) $$x_1 = q_1 = \frac{(W-x_0)(1+r)r}{2(1+r)},$$

where x_1 and q_1 are the level of consumption of nondurables and durable services in each period starting in period 1. Expected lifetime utility if the consumer does not buy a durable in period 0 ($U_{Don't}$) is:

(6) $$U_{Don't} = \mu - \frac{a}{2}\frac{r}{2+r}\mu^2 - \frac{a}{4}r\sigma^2 + V_0,$$

where V_0 is the utility that the consumer receives from a fully depreciated durable or if he does not own any durable at all.[1]

If the consumer <u>does</u> buy a durable in period 0, before the value of lifetime wealth is learned, then

(7) $$x_0 = q_0 = \frac{r\mu}{2(1+r)}, \text{ and}$$

(8) $$x_1 = q_N = \frac{(W - x_0 - \alpha q_0)r}{1 + \left(\frac{1}{1+r}\right)^{N-1}},$$

where q_N is the quality of the durable that the consumer buys in period N, and every N periods in the future. The expressions for x_0 given in equations (4) and (7) show that spending on nondurables will be higher if the consumer is foregoing the purchase of a durable than if he were consuming both nondurables and a durable in period 0. Expected utility if the consumer does buy a durable in period 0 (U_{Do}) is:

(9) $$U_{Do} = \mu - \left(\frac{1}{2}a + \frac{1}{2}a\alpha\right)\left(\frac{r\mu}{2(1+r)}\right)^2 - \left[\frac{\frac{1}{2}ar}{1 + \left(\frac{1}{1+r}\right)^{N-1}}\right]\left[\left(\mu - (1+\alpha)\frac{r\mu}{2(1+r)}\right)^2 + \sigma^2\right].$$

Using the expressions for $U_{Don't}$ and U_{Do} and grouping terms in μ and σ^2 together, one can show that

$$(10) \qquad \Delta U = U_{Don't} - U_{Do}$$

$$= -V_0 - \frac{a}{4}\frac{\mu^2 r^2}{(2+r)(1+r)} + \frac{a}{4}\sigma^2 \frac{\left[1 - \left(\frac{1}{1+r}\right)^{N-1}\right]}{\left[1 + \left(\frac{1}{1+r}\right)^{N-1}\right]} .$$

If this difference is positive, the consumer delays purchasing a durable until period 1 when the level of lifetime wealth is revealed. If it is negative, the consumer does not delay the purchase.

From (10) it is easy to see that the derivative of ΔU with respect to σ^2 is positive: an increase in uncertainty about future income tends to move ΔU in the direction of being positive. Thus, it makes it more likely that the consumer will find it advantageous to delay purchasing the durable until the uncertainty is resolved in period 1.

As the model is written, it is equally costly for all consumers to forego the purchase of a durable in any given period. As a result, if the rise in uncertainty is large enough to cause anyone to not buy a durable in period 0, it causes everyone to not buy a durable. Thus, the model predicts that spending on durables, if anything, stops completely in response to a rise in uncertainty. This implausible result can be eliminated by assuming that the cost of foregoing purchasing a durable varies across consumers. For example, foregoing purchasing a new car is more costly for an individual whose fully depreciated car needs expensive repairs in order to run another year than for an individual whose old car is still running smoothly. In the context of the model above, this simple heterogeneity can be incorporated by assuming that V_0, the utility one receives from a completely depreciated durable good or from no durable at all, varies across consumers. When this heterogeneity is introduced,

aggregate spending on durables falls but does not go to zero in response to temporary uncertainty.

Extensions of the Basic Model

While the simple model above is adequate to show that a temporary rise in uncertainty leads to a drop in consumer spending on durables, there are some extensions that make the model both more complete and more realistic. One useful extension concerns the possibility of resale. The simple model above assumes that once a consumer purchases a good, he is stuck with it until it wears out. However, it is more realistic to suppose that there is an active resale market for some goods. To make resale possible in the model above, one needs to introduce some heterogeneity of income across consumers. With this heterogeneity, there is a market for used goods regardless of the realization of future income because consumers with different income levels purchase goods that turn out to be inappropriate for the original buyers.[2] For example, if an individual buys a car of moderate quality and then finds out that income is lower than predicted, he can sell the car to a wealthier person who wishes to buy that level of quality.[3]

If there were a perfect resale market for every durable good, then all durables would be just like nondurables and a temporary uncertainty would have no effect on spending on durables. However, we suspect that resale markets for most durables are far from perfect, so temporary uncertainty can cause a decline in aggregate spending on durables. Furthermore, the resale markets for some durables are much better than for others.[4] As a result, the purchases of goods for which resale is easy will behave much more like nondurables than will the purchases of goods for which resale is

difficult. In this case, purchases of goods for which resale is easy would decline less in response to a rise in uncertainty than purchases of goods for which resale is very difficult.

A second extension concerns the life span of the durable good. In the model above, there is just one durable good and it lasts for N periods before it depreciates completely. In fact, however, goods differ in longevity. In particular, there exists a class of goods, traditionally called semidurables, that last decidedly longer than perishables such as food and fuel, but less long than durable goods such as stoves and cars. Goods in this category include shoes, clothing, household linens, and automobile tires. The effect of temporary uncertainty on purchases of these goods depends on the relative importance of two competing factors.

On the one hand, the resale potential of such semidurable goods is particularly poor. There is very little market for used shoes and clothes. The previous discussion suggests that this inability to resell will make semidurable goods very susceptible to the negative effects of temporary uncertainty. On the other hand, the purchase/do not purchase condition of the basic model given in (10) shows that making N smaller (that is, shortening the life span of the durable) makes the derivative of ΔU with respect to σ^2 smaller. The intuition behind this result is that the cost of delaying the purchase of new semidurables is similar to that of delaying the purchase of durables, but the period over which one reaps the benefit of waiting (consuming the optimal amount of semidurable services given the realization of income) is shorter. As a result, there is a tendency for semidurable purchases to decline less in response to uncertainty than durable purchases.

While it is not obvious which of these two tendencies is stronger, it

seems likely that the lack of resale might be severe enough for uncertainty to have a strong depressing effect on sales of semidurables. This is especially likely to be the case if the life span of semidurables is fairly long and the temporary uncertainty is expected to be resolved quickly.

Effect of Temporary Uncertainty on Investment

The model and extensions discussed above examine the effects of uncertainty about future income on consumption. It is useful to examine how this uncertainty might also affect investment. As mentioned above, Bernanke (1983a) provides a model of the effect of temporary uncertainty on investment spending. He shows that when there are various projects with different payoffs under different states of the world, increased uncertainty about the future state of the world can lead to a pause in investment as investors wait to gather more information.

Bernanke applies his model to the effect of an oil cartel on investment in technologies that can either be oil-intensive or oil-saving. However, it is possible that there are situations where the level of future income could also be an important determinant of the relative payoff of various projects. For example, suppose there are increasing returns to scale in the technology for producing some good. In this case, if one expects demand to be high in the future, one would invest in a large plant; if one expects demand to be low in the future, one would invest in a smaller, less efficient plant. If uncertainty regarding future aggregate income rises temporarily, one might forego all investment spending for a while and wait for the uncertainty to be resolved.

This example shows that temporary uncertainty about future income could have a depressing effect on investment spending. At the same time,

however, the specificity of the example suggests that the conditions under which income uncertainty affects investment may be limited. Whereas temporary uncertainty about future income is likely to have a pervasive effect on consumers, only some investors are likely to be have projects whose relative payoff is dependent on the realization of future income. As a result, it is likely that temporary uncertainty about the future state of the economy has a substantially larger negative effect on consumers than on producers.

Application of the Model to 1929-30

While the model and extensions discussed above show that temporary uncertainty can cause a drop in spending, there remains the question of how and why the stock market crash of October 1929 might have generated widespread temporary uncertainty about future income. The most straightforward story about the rise in uncertainty in November 1929 starts from the presumption that the stock market experienced a speculative bubble that burst in October 1929. This presumption is supported by a wide variety of contemporary and modern economic analysts.[5] Under this assumption, the drastic decline in stock prices is an exogenous event because the bursting of a bubble is typically related to arbitrary events, not to changes in fundamentals.

This exogenous event may have caused uncertainty about future income for a variety of reasons. One scenario that fits with many contemporary accounts is that people realized that this exogenous crash could disrupt credit markets and reduce investment. At the same time, they were hopeful that the government would step in and stabilize or stimulate the economy. These contradictory possibilities following the Great Crash made people

much more uncertain about what future income would be than they were before the crash.

It is also possible to argue that the stock crash generated uncertainty without assuming that the collapse of stock prices in 1929 was necessarily the result of the bursting of a speculative bubble. It is possible that stock market was thought to be an imperfect predictor of the real economy by agents in the prewar economy. In this case, standard linear prediction theory indicates that a larger than usual movement in stock prices is likely to be associated with greater uncertainty about one's prediction of future income. Thus, even if the decline in stock prices was not an exogenous event, it could have caused a temporary rise in uncertainty if individuals were using it to forecast the real economy.[6]

Both of these stories explain why uncertainty may have risen dramatically following the Great Crash. However, in order for the model given above to predict that real consumption spending will actually decrease in this situation, the assumption that prices are constant must also hold. While this is not literally the case in 1929 and 1930, prices of consumer goods move surprisingly little in the months immediately following the Great Crash. For example, the aggregate consumer price index (CPI-W, 1957-59 = 100) fell less than 1 percent between October and December 1929 and less than 2 percent between January and June 1930. This suggests that the basic preconditions necessary for the simple model given above to apply to the first year of the Great Depression are indeed met.

II. EMPIRICAL EVIDENCE

In this section I examine the behavior of several sales and production

series to see if it is consistent with the view that the stock market crash of October 1929 depressed the real economy by causing consumers and investors to become temporarily uncertain.

Empirical Predictions of the Uncertainty Hypothesis

The model and extensions of the uncertainty hypothesis presented in Section I make several predictions about the behavior of various economic variables around the time of the Great Crash. The simplest of these is that spending on durable goods should have declined soon after the rise in uncertainty in October 1929.[7] Furthermore, if the rise in uncertainty following the Great Crash was very large, then the drop in spending should also have been very large.

This prediction need not be unique to the uncertainty hypothesis. Models that assume that consumption is driven only by income and wealth might also predict a large fall in spending in late 1929 and 1930, provided that wealth declined a sufficient amount. Similarly, models that assume that current spending is affected by expectations of future income might predict that spending would drop in late 1929 if consumers became convinced that a severe drop in income were imminent. However, as the survey of the literature in the introduction suggests, the fall in wealth and the forecasts of future income were such in 1929 that one would not have predicted a large fall in spending following the Great Crash. Thus, the prediction that spending should fall substantially in November 1929 is an important identifying characteristic of the uncertainty hypothesis.

More unique predictions of the uncertainty hypothesis concern the composition of any decline in spending or output that occurred following the Great Crash. First, the model of consumer behavior in Section I

indicates that while sales of durable goods should fall in response to a rise in uncertainty, sales of nondurables should in fact rise in the same situation. This prediction differs from the predictions of models of consumer behavior that stress the importance of wealth, income, or future income. These models typically predict that spending on both durables and nondurables will decline in response to a decline in actual or expected income or wealth, though spending on durables will decline more (because a larger movement in durables purchases is needed to yield a given change in the flow of consumption services).

A second important prediction of the uncertainty hypothesis about composition concerns which type of durables purchases will be most affected. The discussion of resale in Section I suggests that durable goods for which resale is difficult should experience a larger drop in sales relative to usual than goods for which resale is easy. This prediction is different from that of models of consumer behavior that stress the importance of income or wealth. These models typically do not predict that durables with poor resale potential should fall more than others.

A third prediction involves the behavior of semidurable goods. As discussed in Section I, semidurable goods typically have very poor resale potential. Thus, provided that their shorter life span does not reverse the effects of this inability to resell, one would expect sales of semidurables to be particularly negatively affected by a rise in uncertainty.

A fourth prediction concerning the composition of spending is that the rise in uncertainty following the Great Crash should have had a relatively larger effect on consumers than producers. This suggests that

sales of consumer durables should fall more relative to usual than sales of producer durables. This prediction differs from that of traditional models of economic fluctuations which postulate that investment spending is more susceptible to exogenous shocks and hence may tend to have more extreme fluctuations than consumption.

In addition to these predictions about the decline and the changes in the composition of spending immediately following the Great Crash, the uncertainty hypothesis also makes a unique prediction about the historical relationship between consumer spending and stock market variability. Provided that uncertainty about future income is a stable, positive function of stock market variability, it should be the case that consumer spending on durable goods and stock market variability are inversely related over long periods of time. This prediction is clearly one that is different from more conventional models which predict that the level of the stock market rather than the variability of stock prices should be positively related to consumption.

Decline in Spending

Data bearing on the simplest prediction of the uncertainty hypothesis - that spending on durable goods should have declined in November 1929 - are plentiful. A variety of sources provide monthly data on sales of different types of products for the period around the Great Crash.

The best known of the retail sales series is the Federal Reserve Board (FRB) index of department store sales. (For the exact source of this and all the other monthly spending series, see the notes to Table 1.) This series begins in 1919 and accounts for approximately ten percent of total retail sales in the United States in the late 1920s.[8] Department stores

carry some consumer goods that last many years, such as furniture, floor coverings, luggage, and china, and some consumer goods that last only a few years, such as clothing, shoes, and linens. As a result, this sales series clearly covers a mixture of consumer durable and semidurable goods. Another sales series that is available and covers similar goods is one showing the total value of sales from the two largest mail-order houses of this period, Montgomery Ward and Sears.

There are two other series that show monthly spending on durable goods. One is a series on new automobile registrations that is available for the period after 1925. This series appears to provide a good measure of automobile sales. The second is a series on new construction contracts awarded in a given month. This series shows the square footage of buildings put under contract to be built within the next 60 days. Hence, it provides a rough measure of spending on new construction. Because the construction contract data are divided into residential and nonresidential building, they can be used to analyze whether consumer spending on new construction differed from commercial spending.

There are also two retail sales series that show the behavior of sales of nondurable goods. One is the value of sales of the four major five-and-ten-cent store chains. The other is the FRB index of the sales of grocery store chains. The FRB grocery store series only exists through December 1929. Since the FRB discontinued it because it felt that the index was no longer representative of national grocery store sales, the quality of this series in the late 1920s is clearly somewhat suspect. Despite this flaw, it is useful to have these series on sales of nondurables to compare to the series on spending on durable goods.

I deflate the series for department store sales, mail-order sales, and

ten-cent store sales by the aggregate, seasonally unadjusted consumer price index (CPI). I deflate the series for grocery store sales by the seasonally unadjusted CPI for food. Because the series on car registrations and construction contracts awarded are already in real terms, no deflation of these series is necessary.

For each monthly spending series I then estimate an equation of form:

$$(11) \qquad s_{it} = \alpha_i + \sum_{j=1}^{4} \beta_{ji} s_{it-j} + \sum_{k=2}^{12} \gamma_{ki} d_k + \delta_i t,$$

where s_{it} is the monthly percentage change in series i, d_k is a dummy variable for the kth month, and t is a linear time trend. The monthly dummy variables are included to account for seasonal movements, the own lags to account for serial correlation (arising, for example, from sector-specific shocks) and the linear trend to take into account the possibility that the growth rate of spending may have an upward trend.

This regression is run over the period 1919:1-1928:12 for all the spending series except automobile registrations, for which data do not become available until 1925:1. Thus, this regression summarizes the usual behavior of spending in the 1920s. I then do a static forecast of each series for late 1929 and early 1930 using the coefficients estimated through 1928. The difference between the forecasted monthly values and the actual percentage changes in spending provides a measure of whether the behavior of spending was aberrant following the Great Crash. The use of a static forecast ensures that a given forecast error reflects the new residual for each month, not the cumulative effect of previous forecast errors.

The estimated forecast errors for September 1929 through March 1930 for each monthly spending series are given in Table 1. The standard error

of each regression for 1919-1928 is also given so that one has a basis for gauging whether the forecast errors are large relative to the predictive power of the regression.

The main result is that for the series corresponding to consumer spending on durable and semidurable goods, namely department store sales, mail-order sales, new car registrations, and residential construction contracts, there does appear to be a large forecast error in November 1929. For department store sales the forecast error in November 1929 is almost twice the size of the standard error of the regression; for automobile registrations it is one-and-a-half times the standard error; and for mail-order sales and residential construction contracts it is the same size as the standard error. That the forecast error is large and negative in November indicates that the actual percentage change in all of these categories of spending between October and November 1929 was much smaller than one would have predicted given the usual behavior of sales in the 1920s. This is exactly what the uncertainty hypothesis predicts should be the result of dramatic rise in uncertainty following the stock market crash.

For these same four series there is also a substantial forecast error in October 1929. This finding is consistent with the uncertainty hypothesis because the uncertainty related to the decline in stock prices may well have begun with the first large drop in stock prices on Black Thursday, October 24, 1929. If spending dropped precipitously in the last seven days of October, this would be enough to cause a moderate forecast error in sales in this month. At the same time, because part of October should have experienced normal sales, it still makes sense that there should be another, larger error in November.[9]

After the large negative forecast errors in October and November 1929, all four of these series on sales of durables show smaller errors, some positive and some negative, in December. This behavior is also roughly consistent with the uncertainty hypothesis. In its simplest form, the uncertainty hypothesis predicts a one-time drop in spending following the Great Crash; after that drop, it predicts that spending would stay low until the uncertainty is resolved. Thus, one would not expect to see further important negative forecast errors in December.

One potential problem with this analysis is that large forecast errors return in January and several other months in 1930. However, as I describe in the next section, it appears that the further stock price declines and the confusion caused by the government's attempts to deal with the Great Crash generated additional surges in uncertainty during much of 1930. If this argument is correct, then the large declines in spending on durables in 1930 relative to what one would predict from their past behavior is consistent with the uncertainty hypothesis.

Changes in Composition

There are three predictions concerning the composition of spending after the Great Crash that apply to the uncertainty hypothesis but not to more standard models of consumer and producer behavior. These unique predictions are that spending on nondurables should have risen while spending on durables should have fallen relative to usual, that spending on durable goods with poor resale potential (including semidurable goods) should have fallen more relative to usual than spending on goods with easy resale, and that spending on consumer durables should have fallen more relative to usual than spending on producer durables.

Behavior of Spending. The size and sign of the forecast errors from the prediction equations for the various monthly spending series given in Table 1 can provide some evidence on the presence of the composition effects predicted by the uncertainty hypothesis. First, in addition to showing the forecast errors for the series on spending on durable goods, Table 1 also shows the forecast errors for series covering the spending on some nondurable goods. From Table 1 it is clear that while spending on durables declines a great deal relative to usual following the Great Crash, spending on nondurables does not show the same pattern. Ten-cent stores show large negative forecast errors in September and October, but essentially no error in November. Grocery store sales also show a large negative error in September, but a positive forecast error in October and only a very small negative error in November. The fact that there is not a large negative forecast error in November 1929 in either of these series is broadly consistent with the uncertainty hypothesis, which would predict that the fall in sales should be limited to durable goods.[10]

Second, the behavior of construction contracts provides evidence that spending on consumer durables was more affected by the Great Crash than spending on producer durables. The prediction equation for residential construction contracts has large negative forecast errors in October and November of 1929. The prediction equation for commercial and industrial construction contracts has a large negative forecast error in September 1929 and a small negative error in October 1929, but then actually has a positive error in November 1929. This difference in the behavior of residential and nonresidential construction contracts is consistent with the uncertainty hypothesis which predicts that consumers will contract their spending more than producers in response to a temporary rise in

uncertainty about future income.

While this analysis of the behavior of monthly spending data suggests that the composition effects predicted by the uncertainty hypothesis may be present, the available data are not completely adequate for testing these predictions. Because we do not possess monthly data on total spending, it is impossible to discuss the behavior of spending on different categories of goods controlling for the overall movement in spending.

Behavior of Commodity Output. This limitation can be overcome somewhat by examining annual data on the real output of commodities destined for domestic consumers and producers. The Shaw (1947) series on commodity output for 1889-1933 provides good estimates of the output of approximately 40 different classes of consumer and producer goods.[11] Because Shaw provides a measure of the total production of commodities as well as the many disaggregate output series, it is possible to see how the production of particular kinds of producer and consumer goods typically moves with total production in the late 1800s and early 1900s. Then one can examine whether the production of certain types of goods is aberrant in 1929 and 1930 in the ways predicted by the uncertainty hypothesis.

To see if the production of certain goods behaved aberrantly, I perform the following test. Over the period 1889-1928 I regress the percentage change in a given category of commodity output on one own lag, the current percentage change in total output, one lag of the percentage change in total output, and a constant.[12] That is, I run

$$y_{it} = \alpha_i + \beta_i y_{it-1} + \gamma_{1i} y_t + \gamma_{2i} y_{t-1}, \tag{12}$$

where y_i denotes the percentage change in the production of a category of goods and y denotes the percentage change in the total production of commodities. This regression should both capture the usual relationship

between, say, the production of cars and total production, and allow for category specific shocks that may have some persistence.

I then forecast the production of each category of commodity output in 1929 and 1930, taking as exogenous the actual movement in total production in these years and the past movements in all types of production. The difference between the actual percentage change in production in 1929 and 1930 and the predicted value is a measure of whether the production of a particular good is unusual in these two years. These resulting forecast errors for each category of goods as well as the standard error of the corresponding regression are given in Table 2.

Before one can say whether the pattern of forecast errors is consistent with the uncertainty hypothesis, one must deal with the question of whether production data can be taken to represent consumption and investment spending in the years surrounding the Great Crash. Because the Shaw production series is already adjusted to take into account net exports, the only question is whether inventory behavior is aberrant in 1929 and 1930. In the regression above, if inventory investment has some typical cyclical pattern which continues into 1929 and 1930, then a forecast error in a production equation also represents a forecast error in spending. However, if inventory investment deviates from its usual cyclical pattern in 1929 and 1930, then the forecast errors in production could either over- or understate the true forecast errors in spending.

Actual data on inventories for the period 1889-1930 which could resolve this ambiguity are sparse. However, the classic study by Abramovitz concludes that in the interwar era total inventory investment tended to be procyclical as it is today (Abramovitz, 1950, p. 345). At the same time, Abramovitz's data on total real inventories as of December 31st

show a definite rise in inventories in both 1929 and 1930. Since total output declined substantially in 1930, this fact suggests that more production than usual went into inventories in this year. This indicates that a given forecast error in production will actually translate into a larger forecast error in consumption or investment. Thus, the behavior of the Shaw production series can be taken to represent a lower bound on the size of the negative forecast errors in the various categories of consumption and investment.[13]

An additional problem in interpreting the results stems from the fact that the Shaw production data are annual. If the uncertainty hypothesis is correct, then 1929 should have been a normal year until October, and then spending on certain types of goods should have fallen greatly in the last two months. As a result, this drop is likely to cause only a small negative forecast error in 1929. On the other hand, provided that the uncertainty is not resolved rapidly and that much of the drop in spending actually is felt in 1930, the forecast error in 1930 should be large for particular commodities.

Having dealt with these complications, one can see that the sign and significance of the various forecast errors given in Table 2 are remarkably consistent with composition effects predicted by the uncertainty hypothesis. First, the forecast errors for nearly all categories of consumer durables and semidurables, as well as for the corresponding aggregates, are negative in both 1929 and 1930. They are also often quite large relative to the standard error of the corresponding regression in 1930. This indicates that consumer spending on durables and semidurables was lower in both 1929 and especially 1930 than one would have predicted given the size of the movement in total output. This behavior is certainty

consistent with the uncertainty hypothesis and echoes that of the sales data discussed above.[14]

Second, the forecast errors for perishable consumer goods such as food, drugs, and fuel are typically positive in both 1929 and 1930, though the errors are never large relative to the standard error of the corresponding prediction regression. The positive forecast errors indicate that production (and as argued above, consumption) of these goods was higher than one would have predicted given the total fall in output. This finding is consistent with the uncertainty hypothesis.

Third, the size of the negative forecast errors for different types of consumer durables also confirms (though somewhat unevenly) the composition predictions of the uncertainty hypothesis when there are differing degrees of ease of resale. Among the consumer durables for which the forecast error in 1930 is particularly large relative to the corresponding standard error are floor coverings and luggage. Among the goods for which the error is very small or even positive are musical instruments and pleasure craft (boats). If one believes, as seems reasonable, that musical instruments and boats are quite easy to resell, while floor coverings and luggage are very hard to resell, this difference in behavior appears to be consistent with the notion that the easier it is to resell a good, the less purchases of that good are affected by uncertainty. This prediction is also confirmed by the fact that household furniture and china, both goods with poor resale potential, have forecast errors that are at least as large as the standard error of the corresponding regression. It is, however, contradicted somewhat by the behavior of jewelry and automobiles which also show a moderately large negative error, despite the fact that resale of these goods should be quite easy. Thus, while there is some evidence that

the composition of the fall in consumption of durables is consistent with the uncertainty hypothesis, the evidence is not unambiguous.

The behavior of semidurable goods confirms the composition predictions of the uncertainty hypothesis more strongly. Semidurables as a whole have a negative forecast error in 1929 that is approximately equal to the standard error of the forecasting equation and a negative forecast error in 1930 that is almost twice the standard error. This is exactly what one would predict from the uncertainty hypothesis because goods such as shoes, clothes and house furnishing tend to have a very limited resale market.

Fourth, the forecast errors for the production of most producer durable goods are positive in both 1929 and 1930. In some cases, such as for aggregate producer durables, the positive forecast error is one to two times the standard error of the corresponding forecasting regression. The fact that the errors for producer durables are typically positive does not mean that investment spending did not fall in 1930; in fact, aggregate production of producer durables fell 22 percent between 1929 and 1930. Rather, it indicates that investment spending fell less than one would have expected given the large fall in total output. This change in the composition of the fall in output is exactly what one would have expected if uncertainty related to the stock market crash had a larger effect on consumers than producers.

Historical Relationship

The uncertainty hypothesis predicts that in general there should be an inverse relationship between consumer spending on durable goods and uncertainty about future income. If uncertainty is a continuous, positive function of stock market volatility, this prediction means that stock

market variability and consumer spending on durables and semidurables should be negatively related over long periods of time.

To see if this is the case, I expand the simple forecasting equation for different classes of commodity output given in equation (12) to include a measure of stock market variability. I run

$$(13) \qquad y_{it} = \alpha_i + \beta_i y_{it-1} + \gamma_{1i} y_t + \gamma_{2i} y_{t-1} + \delta_i v_t$$

where y_{it} and y_t are the percentage change in a class of commodity output and total commodity output, respectively, and v_t is the annual average of the squared monthly change in the value of the stock market. As before, this equation is estimated only through 1928 so that the dramatic events of 1929 and 1930 cannot influence the results.

The resulting parameter estimates for equation (13) for four major classes of commodity output are given in Table 3. For the output of consumer durables and semidurables, the estimated coefficient on v_t is large and negative. This indicates that both large positive and large negative movements in stock prices tend to depress the consumption and production of consumer durable goods just as the uncertainty hypothesis predicts. For consumer perishables the coefficient is large and positive. This is again consistent with the uncertainty hypothesis which predicts that consumers will substitute perishable goods for durable goods in periods of great uncertainty. Thus, for all three types of consumer goods the coefficient has the sign predicted by the uncertainty hypothesis. However, the large standard errors suggest that the relationships are not measured precisely.

For producer durables, the coefficient is relatively small and positive, but not statistically significant. This positive coefficient is consistent with the uncertainty hypothesis which predicts that producer

durables will account for a smaller fraction of the decline in total output when uncertainty is cause of the downturn than when more ordinary factors are depressing the economy.

Given these expanded prediction equations, it is useful to see if the forecast errors present in 1929 and 1930 for consumer durables and semidurables using the simple prediction equations are still present when one explicitly takes into account the uncertainty effects of stock market volatility. The estimated forecast errors for equations (12) and (13) for four major classes of commodity output are given in Table 4. Table 4 shows that including the stock variability measure in the prediction equation eliminates the forecast errors for consumer durables in 1929 and 1930 entirely. For semidurables, including the stock variability measure actually turns the forecast error in 1929 from negative to positive and reduces the negative error in 1930 by 50 percent. These results show that uncertainty effects due to stock market variability can explain most of the unusual behavior of consumer spending on durable and semidurable goods in the first year and a half of the Great Depression.[15] At the same time, the figures in Table 4 show that the expanded prediction equations are much less successful in eliminating the forecast errors for consumer perishables and producer durables.

III. DIRECT EVIDENCE OF UNCERTAINTY

In this section I investigate an entirely different type of evidence concerning the links between the crash of the stock market, uncertainty, and the fall in output in late 1929 and much of 1930. Specifically, I examine the forecasts and analyses of five contemporary business analysts

over the 1920s to determine whether uncertainty was uniquely high following the stock market crash, whether this uncertainty was caused by the crash, and whether uncertainty was believed to have an important negative effect on spending.

The particular forecasts that I analyze are those furnished in Business Week, The Harvard Weekly Letters, The Magazine of Wall Street, Moody's Investors Service, and Standard Trade and Securities Service. (See the appendix for a more information on these sources.) These five business reports are representative of the many such magazines and forecasting services that provided economic information in the interwar period. These reports typically included a prediction about the behavior of output over the coming months and an analysis of the perceived cause of the current situation.

Because of their dual functions, these reports can provide two types on information about the presence of temporary uncertainty around the time of the Great Crash. First, since the forecasters typically provided some indication of their certainty about their predictions, the reports can show whether the forecasters themselves became dramatically more uncertain about the course of economic activity following the collapse of stock prices in 1929 than they did during other periods of upheaval, such as 1920-21. This kind of information is very helpful if one believes either that forecasters mirror the expectations of ordinary consumers and producers or that forecasters play an important role in forming expectations.[16] Second, the analyses of the forecasters may indicate their impression of consumer expectations and uncertainty. If they do this consistently, then this can provide direct evidence on whether uncertainty about the course of future output increased around the time of the Great Crash.

Forecaster Uncertainty

The information that the forecasts provide about forecaster uncertainty due to the Great Crash is striking. An analysis of the confidence expressed by the forecasters shows that forecasters became uncertain immediately following the Great Crash to an extent that was unprecedented in the 1920s. Furthermore, this uncertainty, while perhaps resolved somewhat in the spring of 1930, appears to resurface by mid-1930.

1929. Among the five forecasters, four become definitely more uncertain about the future of business immediately following the collapse of stock prices in late October 1929. This change is particularly noticeable in The Harvard Weekly Letters (referred to as Harvard in the following discussion). In early October 1929, Harvard is certain that a mild downturn is in store for the economy. It states: "business is thus facing another period of readjustment" (October 19, 1929, p. 252). Following the crash, however, Harvard becomes very uncertain. It says: "the unprecedented declines in stock prices . . . make it difficult to estimate at present the amount of injury which will be done to business" (November 16, 1929, p.274). Furthermore, Harvard specifically mentions that it feels that this uncertainty is temporary and that "a month hence it may be possible to appraise the situation more satisfactorily and present a definite forecast for the year 1930" (November 16, 1929, p. 276).

This same pattern is also shown in Moody's Investors Service (Moody's). In mid-October Moody's states with confidence that "certain signs of slightly diminished activity . . . do not, in our opinion, foreshadow a real business depression" (October 14, 1929, p. I-225). However, by November, Moody's is much more uncertain about the course of

future activity. It states: "the extent of net paper losses and their effect can hardly be measured for the country as a whole" (November 18, 1929, p. I-241) and in December it discusses "the extent of the current decline, whatever it will ultimately prove" (December 16, 1929, p. I-257).

Standard Trade and Securities Service (Standard) is somewhat different from Harvard and Moody's in that it is very optimistic before the crash. It states in September that "American business . . . will make another excellent showing in the second half [of 1929]" (September 18, 1929, p. 1). Following the stock market crash in October, Standard, like Harvard and Moody's, becomes much less certain of its forecasts. In November it states that the "full significance of the drastic drop in security values on future business can in no wise be measured" (November 27, 1929, p. 1).

Business Week is also quite positive about the future course of business and quite certain of its forecasts in the fall of 1929. In early October it states that "business is not collapsing; it is merely settling down to a normal pace" (October 5, 1929, p. 3). Following the crash it is definitely more uncertain of its forecast. In early November Business Week states that "early in 1930 business is likely to resume its normal stride, if business men will keep their shirts on and roll up their sleeves" (November 9, 1929, p. 3). In January it is even more uncertain, stating "the forecasters cannot yet read the riddle of 1930" (January 8, 1930, p. 48).

In contrast to the other forecasters, The Magazine of Wall Street (Wall Street) appears to be nearly as certain of its forecasts after the crash as it was before the crash. Wall Street states in September 1929 that "it would require some extraordinary conditions to bring on one of the old-time depressions" (September 21, 1929, p. 953). In November, it states

with equal confidence that "the general outlook for trade and industry is thus one in which moderate restraint may be evidenced for some months, but . . . recovery to a fair measure of prosperous conditions may be anticipated before the new year is far advanced" (November 16, 1929, p. 96). Despite the fact that Wall Street does not show a dramatic increase in uncertainty following the Great Crash, this analysis of forecasts from around the collapse of stock prices indicates that four of the five forecasters were noticeably less confident of their forecasts immediately following the crash than in the months before.

It is important to note that, with the exception of Business Week, all of the forecasters who become less confident indicate that it is due to the stock crash. Several of the forecasters stress that the stock market crash was an exogenous event. There are numerous references to the "gigantic bubble of speculation in stocks," the fact that "the [stock] market is now almost wholly 'psychological'," and "the pricking of the speculative bubble."[17] Forecasters are uncertain about the effects of this exogenous event because they see conflicting tendencies. The forecasters are very aware that in the past drastic movements in stock prices or financial panics sometimes preceded recessions. More importantly, as will be discussed later, all of the forecasters believe that the crash will cause consumer uncertainty which will tend to lower spending and thus depress output. On the other hand, the forecasters see the fact that business inventories are not excessive as a favorable sign and have great faith that the Federal Reserve will lower interest rates and hence encourage investment. The forecasters appear to be unsure about which of these conflicting tendencies will predominate.

While the confidence that forecasters expressed in their predictions

is obviously an important measure of uncertainty, the divergence of forecasts is another measure. Several authors have noted that most of the contemporaneous forecasts were fairly positive following the Great Crash, at least in light of what eventually happened to output over the course of the Great Depression (see for example, Temin (1976) and Dominguez, Fair, and Shapiro (1986)). However, it is clear from a reading of several forecasts that there was more divergence than usual in the point estimates of the forecasts shortly after the collapse of stock prices.

Evidence that this was the case is provided by the fact that the forecasters themselves commented on this divergence frequently. Standard notes that "with the opening of the new year, there is a wide conflict of opinion as to what is in store for industry and commerce during the early part of 1930" (January 3, 1930, p.1). Business Week also notes that "opinions may differ as to whether or not the stock market collapse . . . need necessarily be followed by a serious business recession" (November 30, 1929, p. 44). Such divergence of opinion may be important if one believes that forecasters do not merely mirror public expectations, but actually affect them. In this case, consumers and producers might be made quite uncertain because they are receiving conflicting predictions from the economic experts.

1920s. While this evidence suggests that forecaster uncertainty increased following the Great Crash of October 1929, it does not indicate whether this was a unique event. It could be that forecasters always become uncertain in downturns. To get a sense of whether the rise in uncertainty in November 1929 was unique, I examine the forecasts and analyses of the same forecasters examined above for the periods surrounding the recessions of 1920-21 and 1923-24.[18] As with the previous analysis, I

examine the forecasts from the several months before any signs of downturn through the end of the following year.

I find that the dramatic change in forecasters' expressions of confidence that followed the Great Crash does not occur in either 1921 or 1924. In these earlier downturns there is never a time when several of the forecasters simultaneously express greater uncertainty. Furthermore, several of the forecasters are equally confident throughout both 1921 and 1924. For example, Harvard states with surety in February 1924 that "conditions thus remain favorable to the maintenance of generally good business conditions" (February 2, 1924, p. 28) and again in May with equal confidence that "business is not now facing a period of general depression" (May 17, 1924, p. 134).

In the 1920s some of the forecasters do periodically express uncertainty about their forecasts, but these statements seem to be vague disclaimers, the essence of which is that forecasting is difficult. For example, Moody's ends nearly every forecast with a statement such as "the above interpretation of 1921 developments is, of course, tentative insofar as details are concerned. But I have full confidence that the general trend which I have outlined will develop" (January 6, 1921, p. 7). Similarly, Standard occasionally includes such statements as "the view itself is to be interpreted as an estimate of the probabilities, rather than as a cocksure forecast" (November 26, 1923, p. 375).

There does not appear to be any systematic pattern to these disclaimers, except perhaps that they appear slightly more frequently when the analyst is forecasting a change in direction rather than the continuation of current conditions. Furthermore, they occur at radically different times for different forecasters and are never followed by

statements about when the forecaster expects to be more certain as they often are in 1929. Thus, they are at most statements of permanent uncertainty among the forecasters, not the statements of extreme temporary uncertainty that are so common following the Great Crash. These characteristics indicate that the five forecasters did not become uncertain in these earlier downturns as they did in 1929. This suggests that the rise in uncertainty in 1929 was an unusual event that could have been an important source of the unusually large and mysterious drop in spending and output in the first year of the Great Depression.

1930. While it appears that the rise in uncertainty due to the stock market crash in late 1929 and early 1930 can explain why output plummeted immediately following the crash, there remains the question of why the economy remained depressed and in fact continued to decline through all of 1930. Judging from the five business analyses that I have examined, the answer may be that uncertainty continued or at least reappeared at various points in 1930.

In the spring of 1930 most of the forecasters appear to become both very positive and very certain. For example, Moody's states in April that "the inescapable conclusion is that we are not facing a business depression" (April 24, 1930, p. I-172). Similarly, Harvard, which had said in November that it could not make a forecast, states in April that "what this forecast means for second quarter business may now be indicated more precisely" and forecasts that "by May or June, . . . [there should be] definite evidence of a more substantial recovery in business" (April 19, 1930, p. 104).

This apparent certainty may indicate that uncertainty related to the Great Crash was resolved in the spring of 1930. However, it is possible

that this confidence should not be taken at face value. Beginning in late November, Herbert Hoover called a series of conferences of businessmen, the purpose of which was to "talk up" business. Indeed, Hoover's main response to the stock market crash and the ensuing decline in real output was to promulgate optimistic forecasts and to encourage others to do so as well. It seems very likely that the professional analysts came under pressure to participate in this "prosperity propaganda program" and hence introduced into their forecasts a degree of manufactured optimism.

Indirect evidence that this did happen is provided by the analysis of Standard in the spring of 1930. Standard is openly skeptical of the Hoover program. It states: "officialdom takes the attitude that its function is to point out whatever is bright in the picture" and therefore "the business community cannot look to its political government . . . to analyze business conditions fairly and impartially" (March 19, 1930, p.3). When Standard announces in the same issue that "uncertainties in the situation are still too numerous to permit the formation of an iron-bound opinion as regards the longer term prospect for industrial production" it seems clear that it is proud of not taking part in the Hoover boosterism (March 19, 1930, p.1).

In addition to the fact that many of the forecasters may have been artificially confident in the second quarter of 1930, they are also openly uncertain and negative by the summer. For example, Moody's seems to be quite unsure of its current forecast when it states in June that "within the next two or three months it may be possible to say with more certainty just how far this improvement will go and whether it will be sustained or not" (June 27, 1930, p.I-280). Similarly, Business Week, which seemed to pride itself on positive prognostications in the spring of 1930, states in June that "the prospects of early return to normal levels are less hopeful"

(June 11, 1930, p. 1). This suggests that at the very least forecaster uncertainty rose again in the summer of 1930.

Consumer Uncertainty

As mentioned above, the forecasts of the five business analysts provide evidence not only of their own expectations but also those of average consumers. The descriptions that the business analysts provide of consumer expectations suggest that consumers became uniquely uncertain immediately following the Great Crash. The forecasters also provide plausible reasons for believing that consumers remained uncertain throughout 1930.

1929. Before the crash in 1929, most of the analysts barely mentioned consumers. Those that did merely stressed that consumption was at record levels and that retail sales were expected to remain high. For example, Moody's states in August 1929 that "the large purchasing power in the hands of the people will keep on transmuting itself into effective retail demand for all kinds of consumption goods" (August 12, 1929, p. I-174).

After the crash the references to consumer uncertainty are many. Moody's, for example, argues that the factors which "may ultimately prove more important than any calculated estimate of losses in purchasing power . . . [are] the individual attitude and sentiment of people who have been affected by the stock market." It states further that "the effect of the general sentiment may be to slow down business activity" (both quotations are from Moody's, November 18, 1929, p. I-242). In December Moody's is even more explicit about the rise in uncertainty. It discusses "the stock market break, which undermined general confidence" and indicates that "during the past few weeks almost everybody held his plans in abeyance and

waited for the horizon to clear" (December 16, 1929, p. I-257).

Standard, like Moody's, not only mentions the rise in uncertainty, but also differentiates its effect on consumer spending from the effect of the decline in wealth. Several issues of its report in the fall of 1929 contain statements such as: "reflecting the loss of purchasing power, as well as public confidence, resulting from the collapse of security values, we anticipate a sizable decline in internal business during early future months" (November 20, 1929, p. 1). The Harvard Weekly Letters, while not discussing consumer uncertainty directly, notes that "coinciding with the break in stock prices, department store trade showed a pronounced shrinkage" (November 30, 1929, p. 284) and refers to "a spirit of caution widely prevalent" (December 21, 1929, p. 308).

Business Week and even The Magazine of Wall Street, which does not become obviously more uncertain of its own forecast, also believe that consumers became very uncertain following the stock market crash. In early November, Business Week refers to "the hysteria that accompanied the market upheaval" and the resulting "suspicious and nervous public" (November 2, 1929, p. 3). Similarly, Wall Street states that "in itself, a severe reaction in stock prices has an unfavorable influence on general trade both by curtailing purchasing power and by impairing the confidence of consumers and business men alike." It also notes that as a result of his uncertainty, "there has been a tendency to reduce or postpone projected commitments" (both quotations are from Wall Street, November 16, 1929, p. 94).

All of the forecasters clearly feel that consumers, and to some degree businessmen, became more uncertain about future income as a direct result of the collapse of stock market prices. The forecasters are also quite

explicit about the effect of this rise in uncertainty. They are all certain that it will retard consumer spending on "furs, jewelry, automobiles, radios, furniture, and anything else that may be classified under the title of unessential" (Standard, November 20, 1929, p. 4).

1920s. The emphasis on consumer uncertainty following the Great Crash is particularly remarkable given that consumers are rarely mentioned during other periods in the 1920s. In the downturn of 1923-24, most references to consumers stress that consumption is doing well. For example, Standard states in November 1923 that "still consumption holds its even pace" (November 26, 1923, p. 376) and stresses in April 1924 that "high consumption" is a favorable indicator (April 28, 1924, p. 136). Similarly, Harvard states in the summer of 1924 that "retail trade, during the first half of the year, compared favorably with the corresponding period of last year" (July 19, 1924, p. 202).

As the downturn deepens in the second quarter of 1924, there is some mention of a drop in consumption. However, the source of this drop is attributed to a drop in purchasing power due to rising unemployment. For example, Moody's states in June 1924 that "the growing unemployment, although still moderate, naturally involves a diminution of the public purchasing power, and this diminution is plainly reflected in the sales of retail stores" (June 12, 1924, p. 241). This is very different from the discussion in 1929 where the analysts specifically differentiate between the effect on consumption of the decline in wealth and the rise in unemployment and the effect on consumption of the rise in uncertainty.

In 1920-21 there is some discussion of a drop in consumption but it is much less widespread than in 1929. A few analysts feel that consumer spending is being reduced because of expectations of deflation. For

example, Standard states in the fall of 1920: "the public is displaying caution in its purchases owing to the general expectation that prices will go lower" (October 11, 1920, p. 59). However, the possibility that consumers are feeling uncertain about future income is not mentioned at all. Thus, the qualitative evidence on consumer expectations suggests that the rise in uncertainty in November 1929 was uniquely large and therefore could have had a uniquely strong negative effect on consumer spending.

1930. The descriptions that the business analysts give of consumer and business expectations also suggest that the unusual level of uncertainty in late 1929 continued and perhaps increased through 1930. The Harvard Weekly Letters, for example, states in May that "the latest break in stock prices, both because of the fresh losses entailed and the effect on business sentiment, is an influence temporarily retarding business improvement" (May 17, 1930, p. 128). In June Harvard again states that "current business sentiment is apprehensive" and lists as the reasons for this:

(1) "belated realization that . . . the Washington business conferences must be slow in yielding tangible effects"

(2) "prolonged suspense concerning the tariff revision"

(3) "alarm about the continuing weakness in prominent commodity markets"

(4) "fear of further liquidation in the stock market"

(5) "concern lest the current easy-money policy of the federal reserve system and of foreign central banks may prove short-lived" (June 21, 1930, p. 154).

Moody's also discusses uncertainty in 1930 and stresses the causal role of political factors. In May it speaks of "the widening dissension within the party in power . . . [which] will create even more uncertainty and hesitation in the minds of business men" (May 22, 1930, p. I-229). In

the discussion of consumers, Moody's says that "the recent conservatism in buying [is] caused by lower purchasing power and accentuated by psychological uncertainties" (July 24, 1930, p. I-303, 304).

Standard and Business Week also both see a great deal of uncertainty among producers and consumers during all of 1930. Standard speaks of "this particular time of persistent uncertainty throughout the country" (April 23, 1930, p. 2) and Business Week states that "there is a widespread and disquieting uncertainty as to how far this recovery will go and how long it will be before normal level of activity will again be approached" (February 22, 1930, back cover). Business Week believes that this uncertainty is partly due to "the drastic worldwide deflation of commodity prices" (February 22, 1930, back cover) and partly due to "conflict and chaos in Washington" which has led to "business hesitation in long-time commitments" (May 14, 1930, p. 1).

Both of these analysts also believe that businessmen and consumers are particularly hesitant in 1930 because over-optimistic forecasts led them to expect recovery too soon. Standard, for example, states that "readjustments . . . were postponed in the hope that they would not be necessary" (October 22, 1930, p. 2). Business Week suggests that "business is now suffering chiefly from a pain in the expectations, due mainly to overproduction of official forecasts of early and easy return of the swell times of yesteryear" (May 14, 1930, p. 1). In this way, it seems quite possible that Hoover's prosperity propaganda program could have contributed to the uncertainty of consumers and producers in 1930 because it led to forecasts that were so at odds with actual economic conditions. As a result, people may have decided to delay spending as they waited for further information that would either effectively support or contradict the

official and professional forecasts about the course of income in the near future.

Several of forecasters stress the importance of deliberations over and the eventual passing of the Hawley-Smoot tariff in causing uncertainty both before the Great Crash, and especially in 1930. For example, in June 1930, Wall Street refers to the fact that "uncertainty . . . [has] been the new order of the day" (June 14, 1930, p. 254) and suggests that the "suspense and indecision created by the final outcome of the new rates included in the Hawley-Smoot tariff bill" has been an important cause of this uncertainty (June 14, 1930, p. 289). Business Week reports in June 1930 that business is experiencing "anxiety over effects of the new tariff" and argues that the "flexibility [provisions of the tariff] mean chronic uncertainty" (June 25, 1930, p. 1 and p. 48, respectively).

This evidence indicates that the five business analysts all view consumers and investors as remaining uncertain and perhaps becoming more uncertain throughout much of 1930. However, whereas the analysts all agreed that the stock market crash was the primary source of uncertainty in late 1929 and early 1930, they see more varied sources in the second, third, and fourth quarters of 1930. Continued declines in securities prices is certainly a major source, but commodity price falls, tariff legislation, and excessive government optimism are also seen as important factors generating uncertainty among consumers and producers in mid and late 1930.

The continuation of uncertainty in 1930 may explain why consumption did not rebound after its precipitous decline immediately following the Great Crash. Because consumers remained uncertain, they found it advantageous to continue to postpone purchases of durable goods. The

possible increase in uncertainty in 1930 may also explain why the downturn became more severe. In the context of the simple model of Section I, if uncertainty genuinely increased then this could have caused the downturn to accelerate. In this way, the qualitative evidence suggests that uncertainty can explain not only the initial collapse of output in late 1929, but also the continued drop in consumption throughout 1930.

CONCLUSION AND IMPLICATIONS FOR 1987-88

This analysis has investigated a possible link between the stock market crash of October 1929 and the rapid acceleration of real economic decline in late 1929 and all of 1930. The paper has used theoretical arguments, empirical results, and qualitative evidence on expectations to suggest that the stock market crash temporarily increased uncertainty about the course of future income and that the result of this temporary uncertainty was that consumers, and to a lesser degree investors, cut spending on durable goods drastically as they waited for the uncertainty to be resolved. This story can provide an explanation for some important puzzles that have previously prevented a complete explanation of the Great Depression. Namely, it can explain why consumption spending dropped precipitously in late 1929 and early 1930 despite the fact that such spending is typically a stable function of income, and why investment spending also declined substantially despite the fact that monetary policy appears to have been quite loose.

Given that this paper finds a link between the Great Crash and the onset of the Great Depression, it is natural to wonder whether these results provide insight into the behavior of the economy following the

October 1987 collapse of stock prices. Before answering this question, it is important to point out that there is no reason to presume that a stock crash today will have the same effects that it did 50 years ago. In general, the changes in the structure of the economy and the role of the government that have occurred since the New Deal make it possible that any given shock will have a different effect today than it did in 1929. This is especially true in the case of a stock market crash. In 1929 the collapse of stock prices had large real effects because it generated tremendous uncertainty about future income. If the government today is perceived as a ready stabilizer or if the level of economic understanding has increase substantially over time, then it is possible that a modern stock crash will not generate the uncertainty that it once did.

Despite these caveats, it is possible to find some evidence that forces similar to those present in 1929 were working in the months immediately following the stock market crash of 1987. Between the third and fourth quarters of 1987, real consumption spending declined nearly 1 percent. This is the largest one quarter drop in consumption since the recession of 1980, and is large even in comparison to the drops related to the oil price shocks of the mid-1970s. More importantly, this drop appears to be unrelated to the movements in income that one would normally expect to determine consumption spending. Thus, it is possible that consumers responded to the recent stock market crash by cutting back on their spending on durable and semidurable goods in the same way that they did in 1929.

Following the dramatic one quarter decline, consumption recovered and began to grow at a normal rate. This is obviously different from the first year of the Great Depression when real consumer spending continued to fall

throughout 1930, with only brief periods of respite. However, the experience of 1930 may provide insight into why the economy appears to have recovered so quickly in 1988. In 1930, the uncertainty generated by the October stock crash was not resolved quickly. Rather, as the analysis of the contemporary forecasts in Section III revealed, the uncertainty continued and probably increased during 1930 because of further drastic stock price declines, the collapse of commodity prices, and misguided government policies. As a result of this continued and intensified uncertainty, consumption remained depressed throughout 1930.

In 1988, it is possible that the uncertainty generated by the October 1987 crash was resolved quickly. Since October, stock price movements have been more moderate than they were in late 1929 and early 1930 and the economic news has in general been much more positive. As a result, consumers may have regained their confidence and started spending in 1988 in a way that they did not in 1930. If this true, then this analysis may suggests that it is simple good fortune that has prevented the most recent stock market crash from plunging the U.S. into an economic downturn.

APPENDIX

Sources of Prewar Economic Forecasts

Business Week

1929-30: Business Week. The forecasts appear in the section entitled "Business Outlook."

1920-24: The magazine did not begin until August 1929.

Harvard

1929-30: Harvard Economic Society. Weekly Letters. Most of the forecasts are found in the letter entitled "Business and Financial Conditions: The Business Outlook" which appeared once a month.

1923-24: Harvard Economic Service. Weekly Letters. The forecasts are found in the letter entitled "General Business Conditions."

1920-21: The material which later appears in the Weekly Letters is contained in these years in The Review of Economic Statistics. The relevant sections are entitled "General Business Conditions" and "Review of the First (Second, etc.) Quarter of the Year."

Moody's

All years: Moody's Investors Service. Moody's Investors Service. The forecasts typically appear in the issue entitled "Monthly Analysis of Business Conditions."

Standard

1929-30: Standard Statistics Company, Inc. Standard Trade and Securities Service. The forecasts appear in the monthly issue entitled "The Business Prospect."

1920-24: Standard Statistics Company, Inc. Standard Daily Trade Service. The forecasts usually appear in the supplement entitled "The Business Prospect."

Wall Street

All years: The Magazine of Wall Street. The forecasts appear periodically in articles with varying titles.

ENDNOTES

1. In the case that the durable good is a car, V_0 can be thought of as the utility value of a very old car or the utility that the consumer receives from walking to work or being free of having to maintain a car. I assume that V_0 is small enough that under certainty one will always choose to replace the durable after it is fully depreciated (i.e. after N periods).

2. There is a market for durable goods even in a downturn because a fraction of the stock of durables is depreciating completely in any period.

3. This argument assumes that there is no change in the relative price of new and used durable goods over the cycle. It also does not apply to goods at the extremes of the quality spectrum.

4. Among the factors that might affect whether or not a resale market develops are ease of determining the quality of a used good and the installation or transportation costs associated with the good.

5. See, for example, Galbraith (1955), Chandler (1970), and the contemporary forecasters whose views are discussed in Section III of this paper.

6. Both of these stories provide a partial equilibrium explanation of why a stock crash could generate temporary uncertainty. Neither of them takes into account the fact that if people knew the model given above, they should have known that if they became uncertain following the crash, they would cut their consumption and hence cause a decline in output for sure. As a result, if they were completely rational, they should have been pessimistic following the crash, not merely uncertain. The neglect of this possibility rests on the assumption that consumers and producers do not know the true model of the economy. While this assumption is perhaps unconventional, it appears quite realistic, particularly for the pre-World War II period.

7. The exact timing of this fall in sales is actually somewhat uncertain. Most likely, if uncertainty related to the stock crash were the crucial determinant of the drop in sales, the drop should occur very soon after late October 1929. However, Bernanke (1983a) argues that the drop in spending may not occur immediately if an event must persist for a while before it generates uncertainty.

8. See Federal Reserve Bulletin, June 1944, p. 543 for a discussion of the relationship between department store sales and total retail sales.

9. For mail-order sales, but not for any other series on spending on consumer durables, there is also a substantial residual in September 1929. Because mail-order houses sell mainly to agricultural areas, this drop in September may reflect conditions in the agricultural sector in the fall of 1929.

10. The fact that the forecast errors for both series are slightly negative in November is somewhat at odds with the model given in Section I which predicts that the spending on nondurables should actually have risen in response to temporary uncertainty. This finding could be due to the

fact that the sales series may be driven by industry specific effects or by the fact that income and wealth both fell somewhat in late 1929.

11. For an evaluation of the Shaw series, see Romer (forthcoming).

12. In this estimation the years corresponding to the direct U.S. involvement in World War I, 1917 and 1918, are excluded.

13. This claim assumes that the behavior of inventories of particular types of goods mimics that of total inventories. While postwar evidence suggests that this is a reasonable assumption, it is possible that inventories of particular goods could have fallen, despite the rise in total inventories.

14. It is useful to emphasize that because current total commodity output is included as an explanatory variable in these regressions, the fact that durables always decline substantially in a depression is accounted for. As a result, the forecast errors in other major downturns such as 1893, 1908, and 1921 are typically not large or of a particular sign.

15. As the discussion of previous research in the introduction would suggest, simple wealth effects due to the decline in stock values cannot explain much of the unusual behavior of consumer durables and semidurables in 1929 and 1930. If one replaces v_t in equation (13) with the simple percentage change in the level of the stock market over the year, the forecast errors remain large. For consumer durables the forecast errors are -.062 in 1929 and -.003 in 1930. For consumer semidurable the forecast errors are -.024 in 1929 and -.042 in 1930.

16. Gramlich (1983) suggests that in some situations the forecasts of professional forecasters provide a reasonably good proxy for consumer expectations.

17. These quotations come from Moody's, January 6, 1930, p. W-5; Business Week, September 7, 1929, p. 3; and The Magazine of Wall Street, June 14, 1930, p. 254, respectively.

18. Only these two recessions were analyzed because most of the forecasts do not begin until shortly before World War I. No forecasts are analyzed for Business Week for these earlier cycles because the magazine only came into existence in August 1929.

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TABLE 1

Behavior of Real Monthly Spending

Series	SEE	Forecast Errors of the Prediction Equation for the Percentage Change in Real Monthly Spending (Equation 11) Sept 1929	Oct 1929	Nov 1929	Dec 1929	Jan 1929	Feb 1929	Mar 1929
Department Store Sales	.035	.093	-.026	-.064	.027	-.098	-.034	-.042
Mail-order Sales	.087	-.114	-.098	-.098	.084	-.252	-.155	-.179
Automobile Registrations	.092	.029	-.149	-.137	-.052	-.132	.096	-.170
Residential Construction Contracts	.137	-.059	-.119	-.139	-.071	-.162	.169	-.189
Commercial & Industrial Construction Contracts	.155	-.156	-.038	.031	.028	-.519	.137	.027
Ten-cent Store Sales	.038	-.077	-.059	-.010	-.043	-.035	.010	-.060
Grocery Store Sales	.035	-.068	.017	-.019	.021	NA	NA	NA

Table 1, continued

Sources: The Department Store sales series is from the Federal Reserve Bulletin, June 1944, p. 549. I use the version of the FRB index that covers the entire United States.

The series on Mail-Order sales is from the Survey of Current Business, 1932 Annual Supplement, pp. 50-51, and various earlier issues.

The series on new car registrations for 1925-1929 is from Standard Statistics Co., Standard Statistical Bulletin, 1930-31 Base Book, March 1930, p. 182. The data for 1930 are from various issues of the Automobile Trade Journal and Motor Age.

The residential construction contracts series is series A8 from Lipsey and Preston, 1966, p. 73. The commercial and industrial contracts series is the sum of series A17 and A19 from Lipsey and Preston, 1966, pp. 95-96 and 100-101.

The series on Ten-Cent Store sales is from the Standard Statistical Bulletin, 1932 Base Book, January 1932, p. 174.

The series on Grocery Store sales is from the Federal Reserve Bulletin, April 1928, pp. 234-235, and later monthly issues of the Bulletin.

Notes: For all series I use the version that is not adjusted for seasonal variation. The series for Department Store sales, Mail-Order sales, and Ten-Cent Store sales are deflated by the Consumer Price Index for all goods, (CPI-W, 1957-59=100). The series for Grocery Store sales is deflated by the Consumer Price Index for food (CPI-W, 1969=100). Both these price series are from the Bureau of Labor Statistics, Historical Summary from Detailed Monthly CPI Reports, microfiche, 1987.

TABLE 2

Behavior of Real Commodity Output

Commodity Output by Minor Group	SEE	Forecast Errors of the Prediction Equation for the Percentage Change in Commodity Output (Equation 12) 1929	1930
Consumer Perishables			
Manufactured Food	.050	-.018	.051
Nonmanufactured Food	.068	-.058	-.023
Tobacco Products	.053	.033	-.043
Drugs and Toiletries	.065	.028	.037
Magazines and Newspapers	.109	-.032	.033
Manufactured Fuels	.094	.065	.007
Nonmanufactured Fuels	.128	-.038	-.146
Total	.035	-.008	.020
Consumer Semidurables			
Dry Goods and Notions	.075	.028	-.044
Clothing	.069	.005	-.053
Shoes and Boots	.059	-.003	-.075
House Furnishings	.069	-.011	-.001
Tires and Tubes	.247	-.291	-.101
Total	.043	-.035	-.070
Consumer Durables			
Household Furniture	.077	-.082	-.102
Stoves and Furnaces	.158	.037	.053
Floor Coverings	.065	.017	-.238
China and Utensils	.122	-.038	-.110
Musical Instruments	.117	-.281	.320
Jewelry and Silverware	.194	-.041	-.208
Luggage	.075	-.008	-.169
Motor Vehicles	.240	-.268	-.327
Motor Vehicle Accessories	.247	-.227	.094
Pleasure Craft	.165	.327	.420
Total	.078	-.082	-.042

TABLE 2, Continued

Commodity Output by Minor Group	SEE	Forecast Errors of the Prediction Equation for the Percentage Change in Commodity Output (Equation 12) 1929	1930
Producer Durables			
Industrial Machinery	.158	.140	.226
Tractors	.761	.025	-.137
Electrical Equipment	.159	.008	.047
Farm Equipment	.166	.025	.119
Office and Store Machinery	.164	-.103	.113
Office and Store Fixtures	.095	.121	-.177
Locomotives	.243	.113	.707
Ships and Boats	.261	.315	.505
Business Motor Vehicles	.323	.209	-.269
Carpenter's Tools	.136	-.081	.129
Miscellaneous Equipment	.133	.144	.041
Total	.103	.175	.225

Sources: The commodity output series is from Shaw, 1947, Table I-3, pp. 70-77. The series represents commodity output destined for domestic consumption, valued in 1913 dollars.

Notes: Shaw's Table I-3 groups some very minor commodities into a residual category for each major group. These residual groups are not analyzed separately here, but are included in the group totals. The sample period used for estimation is 1889-1916 and 1921-1928. The series for tires and tubes, stoves and furnaces, luggage, motor vehicles, motor vehicle accessories, tractors, and business vehicles do not exist for the entire period 1889-1930. As a result, the starting date for these regressions must be later than 1889.

TABLE 3

Coefficient Estimates for Equation 13

(13) $$y_{it} = \alpha_i + \beta_i y_{it-1} + \gamma_{1i} y_t + \gamma_{2i} y_{t-1} + \delta_i v_t$$

Commodity Output by Major Class	R^2	α_i	β_i	γ_{1i}	γ_{2i}	δ_i
Total Consumer Perishables	.61	.02 (.01)	-.50 (.14)	.42 (.10)	.14 (.11)	17.00 (9.03)
Total Consumer Semidurables	.62	.06 (.02)	-.12 (.16)	.55 (.14)	-.37 (.18)	-11.72 (12.04)
Total Consumer Durables	.78	-.02 (.03)	-.13 (.21)	2.01 (.23)	.05 (.51)	-8.99 (22.67)
Total Producer Durables	.76	-.13 (.04)	-.42 (.15)	2.41 (.31)	1.96 (.45)	3.69 (28.58)

Notes: Standard errors are in parentheses. All real variables are expressed as the first differences of logarithms (i.e. as decimals on the order of .05). A typical value of v_t is .001; v_t is equal to .009 in 1929 and .005 in 1930. The sample period used for estimation is 1889-1913 and 1921-1928. 1917 and 1918 are excluded because they are war years; 1914 and 1915 are excluded because it is impossible to calculate v_t for 1914 because the stock market was closed for 4 months.

TABLE 4

Accounting for the Behavior of Real Commodity Output

Commodity Output by Major Group	Forecast Errors of the Prediction Equation for the Percentage Change in Commodity Output	
	1929	1930
Total Consumer Perishables		
Simple Regression (Eqn. 12)	-.013	.013
With Stock Market Variability (Eqn. 13)	-.154	-.046
Total Consumer Semidurables		
Simple Regression (Eqn. 12)	-.038	-.082
With Stock Market Variability (Eqn. 13)	.060	-.041
Total Consumer Durables		
Simple Regression (Eqn. 12)	-.068	-.022
With Stock Market Variability (Eqn. 13)	.008	.008
Total Producer Durables		
Simple Regression (Eqn. 12)	.186	.222
With Stock Market Variability (Eqn. 13)	.156	.210

Sources: The commodity output series is from Shaw, 1947, Table I-3, pp. 70-77. The stock market index is from Cowles, 1939, Table P-1, pp. 66-67.

Notes: The stock market volatility measure is calculated as the average of the monthly squared stock price changes over the calendar year. The results for the simple regression in Table 4 differ slightly from those in Table 2 because the sample period of the regressions underlying Table 4 excludes the years 1914-1916.