When Do Stock Market Booms Occur? The Macroeconomic and Policy Environments of 20th Century Booms

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Abstract

This paper studies the macroeconomic conditions and policy environments under which stock market booms occurred among ten developed countries during the 20th Century. We find that booms tended to occur during periods of above-average growth of real output, and below-average and falling inflation. We also find that booms often ended within a few months of an increase in inflation and monetary policy tightening. The evidence suggests that booms reflect both real macroeconomic phenomena and monetary policy, as well as the extant regulatory environment.

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I. **Introduction**

Since the mid-1990s, many countries have experienced prolonged periods of rapid price appreciation in equity, housing, and other asset markets which have drawn the attention of economists and policymakers to the role of asset prices in the propagation of business cycles. Economists disagree about the appropriate response of monetary policy to asset price booms. Some argue that financial markets are inherently volatile and that market prices often stray from fundamentals, suggesting that policymakers could improve welfare by deflating asset price booms, especially if sudden asset price declines are likely to depress economic activity. Other economists claim that financial markets process information efficiently, or that policymakers usually cannot determine when assets are mispriced and, hence, that they cannot enhance aggregate welfare by reacting to asset price movements.

Financial historians have long been fascinated by the behavior of asset markets, especially asset price bubbles, crashes and other dramatic phenomena. Research on these episodes has yielded important information about the development of financial markets, and the effects of financial regulation and macroeconomic policy on the stability of markets.[1] We believe that history can also inform the debate about the appropriate response, if any, of monetary policy to asset price booms. Accordingly, this paper investigates the macroeconomic and policy environments in which stock market booms occurred among ten developed countries during the 20th Century. Our multi-country historical approach enables us to explore the association between stock market booms and key macroeconomic and monetary policy variables across a variety of policy regimes and regulatory environments.

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[1] Among Larry Neal's important contributions in this area are his work on the South Sea Bubble, the development of European capital markets from the 16th to 19th Centuries (Neal, 1990), and the British financial crisis of 1825 (Neal, 1998).

We construct monthly, real (i.e., inflation-adjusted) stock price indexes for ten countries for which the necessary data are readily available over most of the 20th Century. We then identify extended periods of unusually rapid appreciation in the indexes for each country, which we define as booms. Finally, we use a simple event methodology to study the behavior of key macroeconomic and monetary policy variables during stock market booms.

We find that booms generally occurred during periods of above-average economic growth and below-average inflation, and that booms typically ended when monetary policy tightened in response to rising inflation. Most booms were procyclical – arising during business cycle recoveries and expansions, and ending when rising inflation and tighter monetary policy were followed by declining economic activity. We also find, however, that some 20th Century booms were not associated with rapid economic growth or low inflation, and that stock markets were often affected by changes in regulation and other events, such as oil price shocks and political upheaval.

Although we are able to examine stock markets and macroeconomic conditions in a variety of settings, the limited variety and frequency of historical data for many countries necessarily means that our study is more impressionistic than formal. For example, whereas the standard efficient markets present value model posits that stock prices reflect discounted expected future dividends, we lack data to estimate confidently expected dividend growth or changes in the discount factor. Hence, we do not address directly the question whether specific stock market booms degenerated into bubbles. Policymakers are unlikely ever to have data that enable them to identify bubbles definitively as they arise, however, and a review of historical experiences can provide insights that help policymakers respond to events in real time.

Section II briefly summarizes prior findings and presents information about the stock market booms in our data. Sections III and IV examine the macroeconomic conditions under which 20th Century stock market booms occurred among the ten countries. Section V summarizes our observations and conclusions.

II. Stock Market Booms and Crashes

Most studies of the relationship between asset booms and macroeconomic conditions focus on the consequences of booms and, especially, of market crashes for macroeconomic activity. Several draw lessons for policy from crash experiences. Recent examples include Bordo (2003), Mishkin and White (2003), and Helbling and Terrones (2004).

Bordo (2003) finds that many, but by no means all U.S. and British stock market crashes of the 19th and 20th Centuries were followed by recessions. A serious decline in economic activity was more likely, he concludes, if a crash was accompanied or followed by a banking panic. Mishkin and White (2003) come to a similar conclusion in their review of U.S. stock market crashes in the 20th Century. They find that a severe economic downturn was more likely to follow a crash if the crash was accompanied by a widening of interest rate credit spreads. The key lesson for policy, Mishkin and White (2003) argue, is that policymakers should focus on the financial instability that can arise in the wake of crashes, rather than on crashes *per se*.

Helbling and Terrones (2004) examine median output growth across major stock market booms and busts of 1970-2001 and find that busts often preceded sharp slowdowns in economic activity. Echoing an observation of Bordo's (2003) about U.S. and British crashes

of the 19th and early 20th Centuries, Helbling and Terrones (2004) find that busts typically coincided with or followed a tightening of monetary conditions.[2]

Whereas numerous studies explore the effects of stock market crashes, relatively few examine the conditions under which stock market booms arise or persist. In a prior paper (Bordo and Wheelock, 2004), we examined episodes of unusually rapid growth of U.S. nominal stock prices during the 19th and 20th Centuries. We found that many such episodes occurred when real output and productivity growth (both labor productivity and total factor productivity) were unusually rapid, suggesting that stock prices were at least partly justified by macroeconomic conditions. By contrast, we found no consistent relationship between the growth of *nominal* stock prices and inflation, but noted that inflation was usually low and stable during periods of rapid growth in *real* stock prices. Here we explore in more depth the macroeconomic conditions under which stock market booms have occurred in the United States and nine other developed countries. In so doing, we hope to obtain insights about the macroeconomic conditions and policies that seem to foster booms, and whether experiences differ across countries.

Defining Booms

There is, of course, no precise empirical definition of an asset boom, and researchers have imposed a number of filters to identify specific episodes that they then define as booms. We adapt the methodology of Pagan and Sossounov (2003) to identify prolonged periods of rapidly rising real stock prices in ten countries for which monthly data on a nominal stock price index and a consumer price index are available from the early 1920s onward: Australia, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, the United

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[2] Helbling and Terrones (2004) also examine the effects of housing market booms and busts, and find that housing cycles have been more closely related to monetary policy, and that housing busts are associated with larger declines in economic activity than stock market busts.

Kingdom, and the United States.[3] We identify the maximum and minimum observations of

the real stock price within rolling, 25-month windows. We require that market peaks and

troughs alternate, and so eliminate all but the highest maximum that occurred before a

subsequent trough, and all but the lowest minimum that occurred before a subsequent peak.

We classify as booms all periods of at least three years from trough to peak with an average

annual rate of increase in the real stock price index of at least 10 percent. We also classify as

booms a few episodes of exceptional real stock price appreciation that were shorter than three

years.[4]

Table 1 lists the episodes we define as booms for each country in our sample. For

each boom, we include information about the average annual percentage increase in the

market index from the market trough to its peak. Because several booms began as recoveries

from market declines, we also note when the real stock price surpassed its prior 25-month

peak, and report the average annual percentage increase in the index after that date.

For comparison, Table 1 also reports information about long-run average annual rates

of change in the real stock price index for each country. For example, the U.S. real stock

price index increased at an average annual rate of 2.4 percent during 1915-40, and at an

average annual rate of 4.4 percent during 1947-2004. Thus, the periods we define as booms

were characterized by rates of appreciation that were substantially higher than long-run

averages. Finally, Table 1 also includes information about the extent to which the real stock

price index declined during the 12 months following a market peak, and from the market

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[3] We selected our sample countries based on the availability of historical data on a stock market index and key macroeconomic series, which obviously gives rise to possible sample selection bias. We are unsure of the extent to which our findings would differ if our sample included recently developed or emerging market economies. The appendix describes our data and sources.
[4] Helbling and Terrones (2004) use a similar procedure to identify booms and busts. Specifically, they identify turning points in the log-level of real equity prices over five quarter windows, and define booms (busts) as the largest one-fourth of all price increases (declines).

peak to the next market trough. Almost all booms were followed by real declines of at least 10 percent within 12 months. Not all booms ended with a spectacular crash, however, and the lengths and sizes of market declines after booms varied widely.

Comparison of stock price index growth rates is problematic because of differences in index composition across countries and over time. For the interwar period, cross-country comparisons are further complicated by differences in when monthly data on a nominal stock price index and inflation are first available, and in the nature and the availability of stock price data for the late 1930s associated with when countries became involved in World War II. For the post-World War II period, we report average growth rates for 1947-2004 for all countries in the sample except Germany, Italy, and Japan, for which we report growth rates over 1950-2004. The real stock price indexes for these three countries exhibit rapid growth during the 1950s compared to average growth rates for subsequent decades. Among the other sample countries, we note considerable variation in average real stock price growth rates, ranging from 2.4 percent for Australia to 5.7 percent for Sweden. Again, however, such long-run cross-country comparisons are problematic because the performance of stock markets varied considerably over time within countries, as well as because of differences in the coverage of industries and firms in the stock market indexes of individual countries.

We find considerable coincidence in the occurrence of stock market booms across sample countries, as illustrated in Figure 1. This figure indicates the number of countries in our sample with an ongoing stock market boom in each month from January 1924 to December 2000 (we omit the 1940s when the stock markets of several countries were closed for extended periods because of World War II). Several countries experienced a substantial increase in real stock prices during the 1920s and a market peak in 1929, as well as booms in

the mid-1930s as their economies climbed out of the Great Depression. Most countries in our sample also had booms in the late 1950s, in the mid-1980s and again in the 1990s. By contrast, there were almost no stock market booms among our sample countries from the mid-1960s to the early 1980s.

Additional information on the co-movement of stock markets among our sample countries is illustrated in Figure 2. We computed rolling, five-year correlations in the monthly percentage changes in the real stock price indexes of each pair of countries in our sample. Figure 2 plots the monthly averages of these correlations between 1920 and 1999. The figure illustrates that the average correlation in the monthly capital returns of the various stock markets varied widely over time. Periods of relatively high correlation included the late 1920s, late 1960s to early 1970s, the mid-1980s, and late 1990s. Except for the late 1960s to early 1970s, each period of high correlation was marked by booms in several countries.

The pattern of average correlations of cross-country returns among our ten sample countries is largely consistent with the findings of studies of international financial integration. Goetzmann et al. (2001), for example, find that equity market returns were relatively highly correlated during the late 19th Century, the interwar period, and in the late 20th Century. And, from evidence on nominal and real interest rate differentials, Obstfeld and Taylor (1998) conclude that international financial markets were highly integrated before World War I. A brief period of high integration occurred again in the late 1920s (as our equity market data also suggest), but fell apart during the Great Depression. Markets gradually re-integrated in the late 1950s and 1960s before entering a period of disintegration associated with the breakdown of the Bretton Woods System of fixed exchange rates in the

early 1970s. International financial markets became highly integrated once again during the 1980s and 1990s, again consistent with the high correlation among stock returns we find in this period.

III. The Macroeconomic and Monetary Policy Environment of 20th Century Booms

The basic efficient markets present value model posits that stock prices reflect discounted expected future dividends and, hence, that price changes reflect changes in expected dividends and/or the discount rate (proxied by the real interest rate). We do not have direct measures of expected dividend growth, or even data that would enable us to estimate confidently expected dividend growth. For the United States, one might look to changes in trend productivity growth to gauge expected growth of output, profits and dividends in the future, but except for recent years, even annual estimates of productivity are not available for other countries. We do, however, have estimates of *current* output growth (GDP) for several countries and, as a first step, we investigate whether stock price booms historically have occurred during periods of rapid output growth. Of course, current output growth rates are not necessarily good proxies for expected future growth unless investors simply extrapolate current output growth rates into the future.

Researchers have identified several channels by which monetary policy might affect stock prices. Monetary policy is often thought to operate through the short-term real interest rate and, thus, policy might affect the real interest rate that investors use to discount future profits, at least in the short run. Indeed, we find that booms typically have arisen when interest rates are low and/or falling, and end following increases in policy rates.

Monetary policy might also affect stock prices through inflation and/or inflation uncertainty. There have been several attempts to explain a negative correlation between the

growth of stock prices and inflation observed in U.S. data. Inflation uncertainty could increase risk premiums. By the same token, a policy commitment to a stable price level that investors view as credible might hasten a boom by reducing risk premiums or raising forecasts of future real growth. This suggests that stock prices could reflect the monetary policy regime. We investigate the association between booms, monetary policy actions, and inflation.

Finally, domestic or foreign shocks of various sorts, including political events, wars, and economic policies of other countries can affect stock prices. At times, countries have used capital controls and other policies to wall off their domestic markets from external forces, as well as to channel capital to specific uses. Various domestic financial regulations, such as margin requirements and ownership restrictions, may also affect the observed associations between stock prices and macroeconomic conditions and monetary policy. A thorough review of the myriad regulations imposed on equity markets over time across the ten countries in our sample is beyond the scope of this paper. We note, however, several instances in which stock market booms appear to have been associated with changes in regulation or other policies.

We begin our study of the macroeconomic environments of stock market booms by examining annual data on real GDP growth and inflation across all boom episodes listed in Table 1. In Section IV, we focus separately on stock market booms of the interwar, early post-World War II, and post-1970 periods.

For all stock market booms listed in Table 1, we computed real GDP growth relative to its long-run average for each market peak year and the eight years before and after each

peak.[5] Real GDP growth exceeded its long-run average during a majority of stock market booms. Figure 3 plots the median real GDP growth rate (relative to its long-run average) in market peak years (year "0") and in the eight years before and after market peaks.[6] The chart illustrates that across all booms, median real GDP growth increased sharply relative to its long-run average during the two years prior to a stock market peak, and exceeded its long-run average by 1.5 percentage points in both the market peak and prior years. Median growth also fell sharply during the two years following a peak. Thus, the typical boom arose when output growth was above average and rising, and ended when output growth stopped increasing. Median output growth fell sharply in the year following a market peak and many booms were followed by a period of economic contraction.

Figure 3 also shows the mean absolute deviation of observations around the median, illustrating the dispersion in GDP growth rates across boom episodes. Observations on output growth are less dispersed during booms, which usually lasted for three to five years before a market peak, than before. Observations are least dispersed from about two years before a market peak year (year "−2") to about two years after a peak year (year "2").

Figure 4 plots median inflation (relative to its long-run average) during booms and their aftermath.[7] Booms tended to arise when inflation was below its long-run average and also falling. The median inflation rate was approximately 1 percentage point below its long-run average between four and seven years before a market peak, and 2 percentage points below its long-run average during the two years prior to a market peak. Inflation tended to

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[5] For the interwar period, we use the average over 1871-1939 as the "long-run" average GDP growth rate. For the post-World War II period, we use the average over 1960-2001.

[6] For all figures in the paper that show annual data, we define year "0" as the year the stock market reached a peak unless the peak occurred in the first half of a year, in which case we define year "0" as the year prior to the year of the peak.

[7] For the interwar period, we use the annual average rate of consumer price inflation over the years for which we have data for individual countries, through 1939, as the long-run average. For the post-World War II period, we use the average rate for 1947-2004 as the long-run average.

return slowly to its long-run average after a market peak. Figure 4 also illustrates the dispersion of observations around the median, as shown by the mean absolute deviation of observations around the median. As with GDP growth, the dispersion of inflation rates around their long-run averages declines over time toward the market peak year.[8]

IV. The Macroeconomic Environments of 20th Century Booms: Subperiods

Although a majority of 20th Century stock market booms in our sample countries occurred during periods of above average real output growth and below average inflation, many booms occurred when output growth was near normal, or even below normal, and/or when inflation exceeded its long-run average. Moreover, booms occurred under a variety of macroeconomic and regulatory policy regimes. We next examine the association of macroeconomic and monetary policy conditions and stock market booms during the interwar, early post-World War II, and recent decades separately. In so doing, we seek to learn more about the associations between macroeconomic conditions, monetary policy, and booms under different environments.

The Interwar Period

World War I was, of course, a major shock to the world's principal economies. Differences in the pace of post-war recovery in individual countries reflected both the extent to which countries were involved in the war and in the economic policies their governments pursued after the war. The United States, for example, experienced high inflation in 1918-19 but deflation and a sharp, but short-lived recession in 1920-21. The abrupt change in macroeconomic conditions reflected a shift from a highly expansionary monetary policy

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[8] Bordo and Wheelock (2006) compare GDP growth and inflation during U.S. booms with the medians across the remaining nine sample countries. They find that the behavior of output and inflation were similar across U.S. and non-U.S. booms, but that, if anything, the association of booms with above-average output growth and below-average inflation was stronger across U.S. booms than across the non-U.S. median.

geared toward financing the government's debt at low interest rates to a tight policy aimed at quashing inflation and protecting the Federal Reserve's gold reserves.[9] The Fed reversed course again in 1922 and the economy recovered quickly. The U.S. economy enjoyed strong average growth and low, stable inflation throughout the remainder of the decade.

The U.S. stock market ran a parallel course, with significant losses during the recession of 1921 followed by a strong recovery. After a brief relapse in 1923, the market turned upward and posted several years of rapid real price appreciation until the market peak in September 1929. Financial historians and other observers have long debated whether the U.S. market was over-valued at its peak. Such notable economists as Fisher (1930) and, more recently, McGratton and Prescott (2004) argue that economic fundamentals could justify stock prices even at the market's 1929 peak. Similar to the "new economy" stories that appeared to explain the stock market boom of the 1990s, advances in technology and management practices were often cited in the 1920s as reasons why U.S. corporations could expect high earnings growth that justified the large increase in stock prices (White, 2006). The 1920s saw rapid diffusion of electric power, the internal combustion engine, and other "great inventions" of the late 19th and early 20th Centuries in American factories and homes (David, 1990; Gordon, 2000). U.S. firms, especially in the manufacturing sector, experienced high average growth of labor and total factor productivity over the decade, though annual estimates suggest that productivity growth had slowed by the time the stock market boom was in full swing.[10]

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[9] See Friedman and Schwartz (1963) and Meltzer (2003).

[10] Productivity change is most appropriately measured between business cycle peaks or other similar points in the business cycle. However, private domestic labor productivity (output/hours) and total factor productivity rose at average annual rates of 3.0 and 2.62 percent during 1920-24, and at average rates of 1.74 and 1.32 percent during 1925-29. In the manufacturing sector, labor productivity rose at an average annual rate of 7.0 percent during 1920-24 and 3.90 percent during 1925-29 (Private domestic productivity: Kendrick, 1961, Table A-XXII; manufacturing sector: Kendrick, 1961, Table D-II).

Despite a highly favorable macroeconomic environment, many economists conclude that by 1929 U.S. stock prices far exceeded levels that could be justified by economic fundamentals. DeLong and Schleifer (1991), for example, compare the prices and net asset values of closed-end mutual funds and conclude that stocks were some 30 percent over-valued in 1929. Rappoport and White (1993) reach a similar conclusion from examining the premium on brokers loans. Other authors, such as Galbraith (1955), emphasize the rapid growth of investment trusts and commercial bank securities affiliates in the 1920s, and their role in enticing unsophisticated investors to the market.

The Federal Reserve did not officially address the question whether the stock market was over-valued, but Fed officials were concerned about the growth of loans used to purchase stocks, and the possibility that Federal Reserve credit was being used to support that growth. The Federal Reserve tightened abruptly in 1928, and pursued a tight policy through the market crash in October 1929 in an effort to choke off the flow of credit to the market. This policy was reflected in both a sharp increase in interest rates and a slowing of money stock growth, which preceded the business cycle peak and may have hastened the economic contraction of 1929-33.[11]

Besides the United States, five of the other nine countries in our sample experienced a stock market boom in the 1920s as their economies recovered from wartime disruption and as international capital markets were reintegrated under the gold exchange standard. Several countries experienced a brief period of rapidly rising real stock prices during the recovery of 1922-24, and a more sustained appreciation when their currencies were made convertible into gold or other hard currencies.

[11] See Friedman and Schwartz (1963), Meltzer (2003), and Wheelock (1991) for discussion and evidence on the Fed's reaction to stock market speculation. Based on a review several measures of monetary conditions, Hamilton (1987) concludes that monetary policy tightened considerably during 1928-29.

The experiences of France and the United Kingdom, for example, illustrate a close association between macroeconomic conditions and policies, and stock market performance. France had a market boom associated with a business cycle recovery in 1920-24, though in real terms the stock market moved little beyond its previous cycle peak. Stock prices then declined rapidly as monetization of government deficits produced inflation and capital flight. The market decline continued until November 1926, when the government budget was brought under control and investors became convinced that inflation would not reignite.[12]

Restored fiscal discipline ended capital flight and brought investors back to the Paris stock market. The exchange rate policies pursued subsequently by the Bank of France further encouraged capital inflows. The Bank pegged the value of the franc against other currencies in December 1926, and restored full convertibility of the franc into gold in June 1928. The exchange rate was, however, pegged well below its pre-war level against the U.S. dollar and British pound, the latter of which had been restored to its pre-war parity in May 1925. Under the exchange rate pegs maintained by the Bank of France and the Bank of England, France tended to attract capital and the United Kingdom tended to lose capital. The Paris stock market boomed in this environment, with the real stock price index rising at a 40 percent average annual rate between December 1926 and February 1929. The London stock market rose at a considerably more modest pace. Between May 1925, when convertibility of the pound was restored, and August 1929, when the London market reached its peak in real terms, the real stock price index rose at an average annual rate of just 7.4 percent. Although above average, this rate of appreciation was well below the rates that the Paris and New York markets experienced over comparable periods.

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[12] On the French economic crisis, see Eichengreen (1992, pp. 172-83).

The U.K. economy also grew at a much slower pace than did either the U.S. or French economies. The Bank of England maintained a tight monetary policy throughout the 1920s aimed first at restoring and then maintaining convertibility of the pound into gold at the pre-war parity. Persistent doubts about the viability of the peg discouraged capital inflows, however, and kept a brake on economic activity and the stock market. Thus, as in both the United States and France, the performance of the U.K. stock market during the 1920s reflected underlying economic performance and macroeconomic policies.

The United States and many other countries experienced a business cycle peak mid-1929, and the major stock markets crashed within a few months of one another. Several months of tight monetary policy, marked by high interest rates and slow money stock growth, preceded the U.S. business cycle peak. The linkages of the international gold standard caused monetary conditions to tighten throughout the world, precipitating the Great Depression (Eichengreen, 1992). The Depression was hard on stock markets. For example, between its peak in September 1929 and low in June 1932, the Standard and Poor's index of U.S. stocks declined 80 percent in real terms.

Economic recovery brought renewed vigor to financial markets in the mid-1930s, when stock market booms occurred in eight of our ten sample countries. As in the 1920s, the timing and extent of these booms were tied to economic recovery and the macroeconomic policies pursued in individual countries. Currency devaluation and/or the imposition of restrictions on gold convertibility was a precursor to economic recovery in many countries (Eichengreen, 1992). Britain abandoned the gold standard in September 1931, and several other countries quickly followed. Stock prices began to rise in the United Kingdom and other countries in mid-1932. Although stock prices posted gains in some countries that

remained on gold, most countries did not have a sustained boom until they had abandoned the gold standard or at least devalued. The United States, for example, experienced a financial crisis and market crash in early 1933, followed by a brief recovery after the Roosevelt Administration suspended gold convertibility and restored confidence in the U.S. banking system. A sustained boom did not begin until the second quarter of 1935, however, when output growth stabilized and the economy began to grow consistently.[13]

Figures 5 and 6 illustrate the association between real economic growth, inflation, and stock market booms during the interwar period. Figure 5 shows median real GDP growth relative to long-run averages during interwar boom episodes, and the mean absolute deviation around the median in each year. Figure 6 shows similar data for inflation. The patterns are like those shown for all 20th Century boom episodes in Figures 3 and 4: Booms tended to occur during periods of above average output growth and below average inflation. During interwar booms, median GDP growth exceeded its long-run average by about 3 percentage points in market peak years, then fell sharply over the two years following market peaks. Median inflation was below its long-run average until the year before a market peak, but rose sharply in the months preceding a market peak.

Both U.S. stock market booms of the interwar period ended within months of a shift in monetary policy. The boom of 1923-29 ended in September 1929, some 20 months after the Federal Reserve began to tighten to stem the flow of credit to the booming stock market.

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[13] Eichengreen (1992, pp. 344) notes that U.S. industrial production and other measures of economic activity fluctuated widely in 1933-34, and argues that the investor optimism created by the Roosevelt Administration's response to the financial crises in early 1933 "fell back substantially when it became apparent that America's departure from the gold standard had not inaugurated a new era of rapid monetary expansion." Among other sample countries, France, Italy, and the Netherlands remained on the gold standard until 1936, though Italy imposed stringent exchange controls in 1934. The Netherlands experienced a slow real appreciation of stock prices from a low point in June 1932, but a significant rise only when it abandoned gold in September 1936. France experienced a market crash in mid-1936, and recovery upon abandoning gold, but no sustained stock market boom.

Although consumer price inflation was minimal, Fed officials viewed speculation in stocks or other assets as a form of inflation that called for monetary restraint.[14]

The U.S. boom of 1935-37 also ended when monetary policy was tightened. After largely staying on the sidelines as gold and currency inflows caused rapid growth of the money stock in 1933-36, the Fed tightened abruptly with a series of increases in commercial bank reserve requirements in August 1936, January 1937, and May 1937. Although the consumer price level had risen only modestly since 1933, the Fed hiked reserve requirements because officials viewed the large volume of reserves that banks held in excess of legal requirements as posing an inflationary threat. The stock market peak occurred in February, immediately after the second reserve requirement increase took effect on January 31, 1937.

Early Post-World War II Era

Stock market booms of the interwar period were closely associated with economic growth, inflation, and both domestic and international monetary policies. New regulations on securities markets and capital flows were introduced during the Great Depression, and intensified during World War II. We next examine stock market booms of the first two decades after the war, when controls on the allocation of economic resources were slowly eased and the international monetary system was reestablished, but many markets remained tightly regulated and international capital flows were restricted.

International capital mobility hit a low point during and immediately after World War II as a result of exchange controls imposed during the Great Depression and strengthened during the war (Obstfeld and Taylor, 1998, pp. 381-91). Capital mobility gradually improved during the 1950s as the European Payments Union and other mechanisms were established to clear international payments and promote trade and economic recovery. Over

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[14] See Chandler (1971) or Meltzer (2003) for discussion of the policy views of Fed officials at this time.

time, countries eased restrictions on foreign exchange transactions and capital movements, and the Treaty of Rome, which created the European Economic Community in 1958, called for dismantling of all restrictions on the free movement of capital among EEC members.

In addition to restricting international payments and capital flows, many countries also tightly regulated domestic capital markets during the war and for several years afterward. In the United Kingdom, for example, all capital market issues were regulated by a Capital Issues Committee until 1959, when controls on domestic issues were relaxed (Dow 1964, pp. 235-36). Many other countries imposed similar restrictions on new capital issues in an effort to allocate the flow of national savings.

The United States imposed comparatively few restrictions on either international payments or domestic capital markets. Still, both were more heavily regulated in the post-war period than they had been during the 1920s. The 1929 stock market crash and subsequent allegations of fraud, insider trading, conflicts of interest, and other financial improprieties led to new regulations and government oversight of U.S. securities markets. Among the important laws enacted to regulate the issuance and trading of securities were the Securities Act of 1933, which required that investors receive material information about securities being offered for sale, and the Securities Exchange Act of 1934, which established the Securities Exchange Commission as the principal federal agency responsible for oversight and enforcement of federal securities laws. The latter act also authorized the Federal Reserve to set margin requirements on stock purchases. Finally, the Glass-Steagall Act of 1933 prohibited the commingling of commercial and investment banking activities.[15]

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[15] The Glass-Steagall Act is the portion of the Banking Act of 1933 that concerns the activities of commercial and investment banks.

The financial regulatory regime that was established in the 1930s remained largely in place throughout the remainder of the 20th Century.

Two waves of stock market booms occurred among our ten sample countries during the 1950s, one centered around 1952-53, and the other around 1958-60. Several countries, including France, Italy, Japan, and the Netherlands had booms that began between 1950 and 1952. Post-war economic chaos gave way to recovery in Europe and Japan as international trade and payments agreements came into force, and U.S. aid – most notably the Marshall Plan – poured in. By 1951, the per capita incomes of the United Kingdom, France and (West) Germany exceeded their pre-war levels by more than 10 percent (DeLong and Eichengreen, 1993). DeLong and Eichengreen (1993) contend that the Marshall Plan was particularly important for European economic recovery. Although the $13 billion in aid transferred from the United States to Western Europe was small relative to the size of European economies, aid was sufficient to give European countries breathing room to meet recovery needs without having to undertake contractionary policies to balance their international payments. Further, DeLong and Eichengreen (1993) argue, the Marshall Plan promoted long-term growth by encouraging the establishment of mixed, market-oriented economies and enabling the unwinding of controls over product and factor markets. Thus, while the Marshall Plan contributed to economic recovery in the short run, it also helped lay the foundation for long-term economic growth by promoting a market-orientation and favorable investment climate. Although many restrictions on capital flows and investment remained, the combination of rapid economic growth and a foundation for future growth was an environment that proved conducive for booming stock markets.

A second wave of European stock market booms began in 1957-58. Economic growth enabled European countries to gradually relax exchange controls and trade barriers during the 1950s. The signing of the Treaty of Rome in March 1957, which created the European Economic Community, and the reestablishment of currency convertibility by several countries in late 1958 were particularly noteworthy events. The timing of stock market booms among European countries suggests that investors viewed these steps as likely to produce rapid growth of corporate profits and national income.[16]

Figures 7 and 8 plot median real GDP growth and inflation (relative to their long-run averages) during stock market booms of the 1950s and 1960s among our ten sample countries. Similar to the patterns observed for the interwar period, median output growth was above average and inflation below average during the booms of the 1950s and 1960s. In market peak years, median real GDP growth exceeded its post-war average by approximately 3 percentage points before falling back after booms ended.[17]

As shown in Figure 8, median inflation rose toward the end of booms of the 1950s and 1960s, as it had toward the end of interwar booms. Interest rates also tended to rise toward the end of booms. Although the Fisher effect can explain why nominal interest rates rise when inflation increases, *real* (ex post) interest rates also rose and money stock growth fell during the last two years of most booms, indicating that monetary conditions tightened. Monetary policy tightening might snuff out a stock market boom by raising the rate at which investors discount expected dividend growth and/or by reducing the path of expected

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[16] See Neal and Barbezat (1998, Chapters 2-3) for information about European economic recovery, integration and policies during 1945-58, and for analysis of the economic effects of the formation of the European Economic Community on its members.

[17] Here we define long-run average GDP growth as the annual average rate during 1960-2001, and long-run average inflation as the annual average rate during 1947-2001. In Japan and many countries of Europe, real GDP growth was higher on average during the "Golden Age" of 1950-73, and especially during 1947-60 than in subsequent decades. See Crafts and Toniolo (1996) and the papers therein for analysis of European economic growth after World War II.

dividends. The Federal Reserve responded aggressively to inflation, especially during the 1950s, and both U.S. stock market booms of the 1950s and early 1960s ended as the Fed tightened in response to rising inflation.[18] The behavior of median interest rate levels and money stock growth rates across all booms of this era indicates that the ends of many booms coincided with monetary policy tightening.

Stock Market Booms of the 1970s-90s

We examine stock market booms of the 1970s-90s separately from those of the 1950s-60s because the macroeconomic and regulatory environments of the two periods differ markedly, and because high frequency observations on a greater variety of macroeconomic series are available only for the period since 1970. The 1970s witnessed the breakdown of the Bretton Woods system of fixed exchange rates, two major energy market shocks, high inflation, and a world-wide slowdown in productivity growth. Only two of our ten countries experienced a stock market boom in the 1970s – Australia and Canada. In both countries, rising commodity prices brought improved terms of trade and a rising stock market. Energy and mining stocks have relatively heavy weight in the market indexes of both countries.

The 1980s and 1990s, by contrast, saw declining energy prices and inflation, higher average output growth, and buoyant financial markets in many countries. Several countries eliminated capital controls and deregulated financial markets and institutions in these years, and financial markets became more integrated across countries. All ten countries experienced a stock market boom during the 1980s, and all but Japan had a boom in the 1990s.

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[18] Calomiris and Wheelock (1998) show that the Fed reacted to rising (falling) inflation by draining (adding) reserves from the banking system, and Romer and Romer (2002) find that during the 1950s the Fed's actions satisfied the so-called Taylor Principle in that policy resulted in changes in the real interest rate that exceeded changes in the rate of inflation.

Advances in information-processing technologies that facilitated global financial transactions and innovations encouraged financial deregulation. Countries adopted reforms to increase the efficiency of their domestic financial markets, tap foreign capital, and respond to various financial innovations, such as electronic trading and trading in stock market futures and options.

The world's first electronic stock exchange, the Nasdaq market, was created in the United States in 1971. The United States deregulated brokerage commissions in the mid-1970s. Other countries followed suit in the 1980s and 1990s, abolishing minimum brokerage commissions and controls on the ownership of brokers and dealers, and establishing electronic trading and derivative securities markets.[19]

The United Kingdom removed exchange controls in 1979; Japan and Germany followed suit in 1980 and 1984 (Yamada, 1991). Other European countries eliminated controls on capital in the late 1980s and early 1990s under the terms of the European Economic and Monetary Union.

In several countries, the removal of capital controls and deregulation of financial markets occurred as part of a sea change in economic policy. Tax cuts, especially on capital income, widespread deregulation of industry, and monetary policies that brought inflation under control produced a more favorable business climate in many countries than had prevailed in the 1970s. In the United States, these policies were augmented by less aggressive anti-trust enforcement, which encouraged mergers and acquisitions and a booming stock market (Wigmore, 1997).

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[19]   For example, Japan permitted foreign firms to become members of the Tokyo Stock Exchange in 1982, and introduced domestic stock index futures trading in 1988 (Kato, 1991). The United Kingdom abolished minimum brokerage commissions, permitted ownership of exchange member firms by outside corporations, and instituted electronic trading in 1986. France abolished fixed brokerage commissions and broke-up the brokerage and market-making cartels, and introduced futures and options trading on the Paris exchange in 1987.

Next, we identify the macroeconomic conditions under which stock market booms occurred during the 1970s-90s. Figure 9 plots quarterly observations on median real GDP growth (relative to its long-run average) during boom episodes.[20] In contrast to earlier periods, when output growth typically exceeded its long-run average during booms, median output growth hovered near its long-run average across the stock market booms of the 1970s-90s. The median belies considerable variation in output growth rates across stock market booms, however. Several countries had a stock market boom in the mid-to-late 1990s. During these booms, output growth exceeded its long-run average in Australia, Canada, Sweden, the United Kingdom and the United States, but was near or below average in France, Germany, and Italy.

Figure 9 plots U.S. real GDP growth (relative to its long-run average) during the 20 quarters before and after the third quarter of 2000, when the U.S. boom of April 1994-August 2000 ended. Over the 18 quarters before the market peak in 2000:Q3, U.S. real GDP growth exceeded its long-run average by about 1 percentage point. This boom was frequently attributed to an increase in productivity growth associated with advances in information technology. Although internet and other information-processing technology stocks experienced the largest price gains, the U.S. stock market boom of 1994-2000 was broadly based as optimists expressed confidence in the prospects of accelerated earnings growth in the "new economy." Figure 10 shows that U.S. labor productivity growth exceeded its long-run average by at least 1 percentage point in three of four years between 1996 and 1999. The figure also shows, however, that across all booms of the 1970s-90s median productivity

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[20] Here we again define the long-run average as the average annual real GDP growth rate for 1960-2001.

growth was near its long-run average.[21] Thus, by occurring when productivity growth was above average, the U.S. boom of 1994-2000 was unusual among booms of the 1980s-90s.

Figure 11 plots monthly observations on U.S. inflation (relative to its long-run average) during the boom of 1994-2000 alongside median inflation across all booms of the 1970s-90s.[22] As in earlier periods, inflation was typically below average during stock market booms of the 1970s-90s, and rising as booms ended. The pattern held true during the U.S. boom of 1994-2000. The increase in the rate of inflation before the August 2000 stock market peak occurred somewhat earlier, however, than the increase in median inflation across all booms.

As with earlier stock market booms, most booms of the 1970s-90s were preceded by several months of monetary policy tightening. For example, the U.S. stock market boom of 1994-2000 ended after just over a year of Federal Reserve tightening. Citing "a significant risk of rising inflation," the Federal Reserve began to tighten in June 1999, and then increased its federal funds rate target by a total of 175 basis points to 6.5 percent over the next 12 months.[23] As a result, the real funds rate, measured as the current month's funds rate minus the trailing year-over-year inflation rate, increased by about 40 basis points, while spreads between short- and long-term Treasury security yields narrowed until the yield curve inverted in early 2000. The behavior of both nominal and real interest rates during other booms of the 1970s-90s show a similar pattern, with median nominal and real rates increasing about 1 percentage point, and about 0.6 percentage points, respectively, within the

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[21] We define the long-run average as the average annual labor productivity growth rate for 1970-2004.

[22] Here we again define the long-run average as the average year-over-year rate of inflation for 1947-2004.

[23] The target had been reduced from 5 percent to 4.75 percent on November 17, 1998. The target was raised to 5 percent on June 30, 1999, and elevated in five more steps to 6.5 percent on May 16, 2000. The quotation in the text is from the transcripts of the Federal Open Market Committee meeting of June 29-30, 1999.

last eight months of booms. Thus, we again find that booms typically ended following a period of monetary policy tightening associated with rising inflation.

V. Observations and Conclusions

Our study of 20th Century stock market booms among ten developed countries finds that markets reflect both underlying macroeconomic conditions and specific economic policy actions. We find that stock market booms were an element of the business cycle, with booms typically arising during cyclical recoveries and other periods of rapid economic growth and ending when GDP growth slowed. Many stock market booms were followed by large declines in real stock prices, if not outright market crashes, and a slowing of economic activity. We also find an association between stock market booms and monetary policy. Booms typically arose when inflation was low and declining, and ended within a few months of an increase in the rate of inflation. Rising inflation tended to bring tighter monetary conditions, reflected in higher real interest rates, declining term spreads, and reduced money stock growth.

During the interwar period, the timing and extent of stock market booms in several countries bore a close relationship to exchange rate policies. France, for example, experienced a stock market boom in 1926-29, after its exchange rate was pegged at a level that encouraged capital inflows and fiscal and monetary policies were adopted that brought inflation under control. The United Kingdom, by contrast, pursued an overvalued exchange rate during the 1920s that resulted in capital outflows, slow economic growth and only modest real stock price appreciation. Similarly, in many countries, the timing of economic recovery and stock market booms during the 1930s were closely associated with devaluation or outright abandonment of the gold standard.

Stock market booms of the 1950s and 1960s reflected economic recovery and rapid growth after World War II. In Europe, actions to reopen markets to trade and capital flows also buoyed financial markets and contributed to two waves of stock market booms. We note in particular an apparent association between stock market booms in several European countries and the dismantling of trade barriers and exchange controls in the late 1950s. Finally, stock market booms of the 1970s-90s were somewhat less commonly associated with rapid economic growth, though the U.S. boom of 1994-2000 did occur during a period of rapid output and productivity growth, as well as low inflation. We speculate that financial deregulation and globalization weakened the links between domestic economic growth and stock markets in the 1980s-90s.

Stock market booms tended to be roughly in sync across countries throughout the 20th Century. Several countries had booms in the 1920s, mid-1930s, 1950s, mid-1980s, and late 1990s, whereas few countries had booms between 1965 and 1980. Stock market returns were more highly correlated across countries during boom periods than at other times. The average correlation was especially high during the late 1920s and 1980s-90s, when financial markets and capital flows were comparatively unregulated. In these decades, international financial markets were relatively highly integrated. Average correlation was relatively low, and booms were less in sync, during the 1950s and 1960s when many of the financial regulations and capital controls imposed during the Great Depression and strengthened during World War II remained in force and interfered with international market integration.

By studying the behavior of financial markets under a variety macroeconomic and policy environments, financial historians can provide much needed insights that help in devising policies that promote the efficient and stable operation of financial markets. The

history of 20th Century stock market booms illustrates a close connections between domestic and international macroeconomic policies, financial regulation, and the performance of stock markets. Our review finds that stock market booms have been closely related to monetary policies, as reflected both by the level of inflation and actions to control inflation. Further, we find that international economic policies, such as capital controls and exchange rate pegs, and financial regulation affect the linkages between domestic economic performance and stock markets. A key lesson for policy, therefore, is that the effects of macroeconomic policies on asset markets are likely to be influenced by both the domestic regulation and the international integration of those markets. Thus, the efficient operation of financial markets would seem to hinge on both macroeconomic and regulatory policies, and how well those policies interact with one another.

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Appendix

This appendix provides information about the data and sources used in this paper. We describe our stock price index data first, and then present information about the data used in each figure in the paper.

Stock price index (nominal, monthly data): For all countries except the United States, our stock price data are from Global Financial Data (www.globalfinancialdata.com). The following lists the Global Financial Data series identifier and description for each country:

Australia: AORDM, Australia ASX All-Ordinaries
Canada: GSPTSEM, Canada S&P/TSX 300 Composite
France: SBF250M, France SBF-250 Index
Germany: FWBXXM, Germany CDAX Composite Index
Italy: BCIIM, Banca Commerciale Italiana Index
Japan: N225M, Japan Nikkei 225 Stock Average
Netherlands: AAXM, Netherlands All-Share Price Index
Sweden: SWAVM, Sweden Affarsvarlden General Index
U.K.: FTASM, UK FT-Actuaries All-Share Index
U.S.: NBER Macro History Database, series m11025a (1871:01-1920:12); Standard and Poor's 500 Composite Index (1941-1943=10), Monthly Average of daily data obtained from Haver Analytics (1921:01-2004:12)

Real Stock price (monthly): We use consumer price index data to deflate nominal stock prices to obtain a real stock price. For all countries except the United States, our consumer price index data are from Global Financial Data. The following lists the Global Financial Data consumer price index series identifier for each country. Monthly observations are available beginning from the month listed in parentheses.

Australia: CPAUSM (1912:01)
Canada: CPCANM (1914:01)
France: CPFRAM (1915:01)
Germany: CPDEUM (1923:12)
Italy: CPITAM (1920:01)
Japan: CPJPNM (1922:01)
Netherlands: CPNLDM (1919:01)
Sweden: CPSWEM (1916:01)
U.K.: CPGBRM (1914:01)
U.S.: BLS, Series ID: CUUR0000SA0, CPI - All Urban Consumers, U.S. City Average, All Items, not seasonally adjusted, 1982-84=100 (1913:01-2004:12)

General Notes about the figures presented in the paper:
- We compute all growth rates using log first differencing, unless otherwise noted.
- For all figures displaying annual data, if the peak month of a boom occurred in the first six months of a year, we attribute the peak to the prior calendar year. Otherwise,

we attribute the peak to the calendar year that it occurred. For figures displaying monthly or quarterly data, we attribute the peak to the actual month or quarter that it occurred.

Figures 3, 5, and 7:

Real GDP: Data are from Maddison (2003), Tables 1b, 2b and 5b for 1871-2001 and the O.E.C.D. for 2001-04. For booms ending prior to 1940, we define the long-run average growth rate as the average growth rate for 1871-1939. For booms ending after 1940, we define the long-run average growth rate as the average growth rate for 1960-2001.

Figures 4, 6, and 8:

Inflation: The sources for consumer price index data are listed above. We compute annual inflation rates by averaging annualized monthly growth rates. For booms ending prior to 1940, we define the long-run average growth rate as the average growth rate from the first available observation through 1939 (first available observations: Australia, 1902; Canada, 1911; France, 1872; Germany, 1924; Italy, 1871; Japan, 1871; Netherlands, 1882; Sweden, 1871; U.K., 1871; U.S., 1870). For booms ending after 1940, we define the long-run average growth rate as the average growth rate for 1947-2004.

Figure 9:

Real GDP: Quarterly data downloaded from the OECDNEQ database of Haver Analytics. Data are available beginning in the quarter listed in parentheses: Australia (1960:1); Canada (1961:1); France (1978:1); Germany (1991:1); Italy (1980:1); Japan (1980:1); Netherlands (1977:1); Sweden (1980:1); U.K. (1960:1); U.S. (1960:1). We compute growth rates as year-over-year growth rates for each quarter. We define the long-run average growth rate as the average growth rate for 1960-2001, calculated using the annual data from Maddison (2003) listed above.

Figure 10:

Labor Productivity: Annual data on GDP per hour worked obtained from the O.E.C.D. productivity database (July 2005). The data for all countries span the years 1970-2004. We define the long-run average growth rate as the average growth rate for 1970-2004.

Figure 11:

Inflation: Monthly consumer price index data from Global Financial Data, listed above. We compute the inflation rate as year-over-year growth in the consumer price index. We define the long-run average growth rate as the average growth rate for 1947-2004.

Table 1

Stock Market Booms

Country	Boom Start: Local Market Minimum	Boom End: Local Market Peak	Avg. Annual % Change from month after trough to peak	Boom Start: When Prior 25-Month Peak Surpassed	Months Duration After Prior Peak Surpassed	Avg. Annual % Change from month after prior peak	Comparison Avg. Annual % Change During Period	Percent Decline 12 Months after Peak	Percent Decline to Next Minimum	
Australia	Dec. 1920	Feb. 1929	10.7	July 1921	91	9.1	3.6	-20.1	-41.0	comparison: Jan. 1915-Dec. 1940
	Sept. 1930	Mar. 1937	17.8	Oct. 1934	30	13.7	3.6	-12.2	-31.6	
	July 1956	July 1960	15.8	Aug. 1957	35	15.9	2.4	-11.6	-20.2a	comparison Jan. 1947-Dec. 2004
	Oct. 1966	Dec. 1969	21.8	Oct. 1967	26	17.5	2.4	-24.8	-42.2	
	Aug. 1977	Nov. 1980	21.9	Sept. 1979	14	32.1	2.4	-27.2	-47.2	
	July 1982	Sept. 1987	25.2	Mar. 1986	18	39.3	2.4	-35.8	-46.3a	
	Dec. 1990	Jan. 1994	18.9	Oct. 1993	3	36.9	2.4	-23.8	-23.8	
	Aug. 1998	June 2000	13.4	Jan. 1999	18	6.5	2.4	-0.8	-23.8	
Canada										
	Dec. 1920	Sept. 1929	17.4	n/a	n/a	n/a	3.7	-37.5	-75.1	comparison: Feb. 1920-Dec. 1940
	June 1932	Mar. 1937	28.0	n/a	n/a	n/a	3.7	-35.6	-35.6	
	Oct. 1953	July 1956	24.6	July 1954	25	23.5	3.4	-9.2	-32.4	comparison Jan. 1947-Dec. 2004
	Oct. 1977	Nov. 1980	22.1	n/a	n/a	n/a	3.4	-25.2	-52.5	
	July 1984	July 1987	17.9	July 1985	24	15.3	3.4	-18.5	-26.7a	
	Jan. 1995	Apr. 1998	19.2	Nov. 1995	29	20.1	3.4	-10.0	-28.2a	
	Aug. 1998	Aug. 2000	34.7	Dec. 1999	8	42.0	3.4	-36.0	-43.6	
France										
	Nov. 1920	July 1924	20.9	n/a	n/a	n/a	2.5	-16.1	-34.7	comparison Jan. 1920-Dec. 1939
	Nov. 1926	Feb. 1929	40.4	Dec. 1927	14	37.9	2.5	-12.0	-57.0	
	Dec. 1950	Apr. 1955	28.4	n/a	n/a	n/a	2.8	-17.4	-11.1a	comparison Jan. 1947-Dec. 2004
	Aug. 1958	Apr. 1962	20	July 1960	21	14.3	2.8	-18.7	-54.1	
	June 1981	Apr. 1987	24.4	Jan. 1985	25	36.2	2.8	-32.8	-45.0	
	Feb. 1995	Aug. 2000	23.6	Jan. 1997	43	26.8	2.8	-29.5	-60.1	
Germany										
	June 1957	Sept. 1960	43.6	Aug. 1958	25	54.1	6.0	-24.0	-49.3	comparison Jan. 1950-Dec. 2004
	Aug. 1982	Apr. 1986	31.8	July 1983	33	28.8	6.0	-18.4	-44.7	
	Mar. 1995	Feb. 2000	23.9	Sept. 1996	41	27.8	6.0	-25.4	-69.9	
Italy										
	May 1932	July 1935	27.5	n/a	n/a	n/a	0.4	-13.4	-20.0a	comparison Feb. 1921-Dec. 1938
	July 1950	Sept. 1955	18.5	Aug. 1952	37	22.7	3.1	-16.6	-22.2a	comarison Jan. 1950-Dec. 2004
	June 1958	Aug. 1960	56.4	Oct. 1958	23	58.7	3.1	-17.6	-17.6	

Dec. 1977	May 1981	35.0	n/a	n/a	n/a	3.1	-46.8	-54.1	
Dec. 1982	Aug. 1986	38.2	Mar. 1986	5	34.3	3.1	-26.7	-47.9	
Nov. 1995	Feb. 2000	33.6	July 1997	31	34.9	3.1	-18.8	-56.5	

Japan

Oct. 1930	Feb. 1934	28.6	Feb. 1932	24	26.1	1.8	-12.0	-16.6	comparison Feb. 1923-Dec. 1940
Jan. 1950	Jan. 1953	54.3	Jan. 1952	12	93.1	6.9	-30.0	-36.4	comparison Jan. 1950-Dec. 2004
Dec. 1957	Jun 1961	36.3	Oct. 1958	32	38.7	6.9	-23.0	-52.7	
Sept. 1982	Dec. 1989	23.9	Mar. 1983	81	22.5	6.9	-41.0	-47.6a	

Netherlands

July 1924	Feb. 1929	10.9	Jan. 1926	36	6.1	-1.8	-15.7	-71.8	comparison March 1920-Dec. 1939
June 1932	Mar. 1937	26.6	n/a	n/a	n/a	-1.8	-18.2	-31.5	
Apr. 1952	June 1957	20.3	Nov. 1954	31	15.4	4.1	-19.8	-32.1a	comparison Jan. 1947-Dec. 2004
Dec. 1957	Mar. 1961	22.2	May 1959	22	15.0	4.1	-10.5	-31.2	
Sep. 1981	July 1987	22.0	Mar. 1983	52	20.1	4.1	-17.2	-36.7a	
Jan. 1991	Aug. 2000	17.4	June 1993	74	19.6	4.1	-26.8	-65.4	

Sweden

Mar. 1922	July 1929	16.9	n/a	n/a	n/a	-1.8	-13.1	-73.3	comparison Feb. 1917-Dec. 1940
May 1932	Mar. 1937	23.2	n/a	n/a	n/a	-1.8	-12.2	-12.2	
Mar. 1958	Aug. 1961	15.1	Aug. 1958	36	13	5.7	-15.3	-20.2	comparison Jan. 1947-Dec. 2004
Sept. 1980	Mar. 1984	36.8	May 1981	34	34.7	5.7	-24.6	-29.3	
Sept. 1992	Feb. 2000	31.4	Sept. 1995	53	30.6	5.7	-31.2	-67.2	

United Kingdom

June 1932	Dec. 1936	15.4	Feb. 1936	10	5.4	-0.4	-23.6	-44.2	comparison Feb. 1916-Dec. 1939
June 1952	July 1955	20.0	July 1954	12	16.4	2.8	-17.3	-31.4	comparison Jan. 1947-Dec. 2004
Feb. 1958	Apr. 1961	25.4	Dec. 1958	28	19.6	2.8	-17.8	-31.0	
Sept. 1981	July 1987	21.3	Oct. 1982	57	21.5	2.8	-23.4	-34.8a	
June 1994	Dec. 1999	12.6	Apr. 1996	44	12.7	2.8	-10.6	-50.2	

United States

Oct. 1923	Sept. 1929	23.7	Dec. 1924	57	24.4	2.4	-30.1	-80.6	comparison Jan. 1915-Dec. 1940
Mar. 1935	Feb. 1937	39.7	Oct. 1935	16	30.2	2.4	-39.0	-45.8	
Sept. 1953	Apr. 1956	28.8	Mar. 1954	25	29.3	4.4	-9.6	-20.1	comparison Jan. 1947-Sept. 2004
June 1962	Jan. 1966	13.3	Dec. 1963	25	10.3	4.4	-12.5	-20.1a	
July 1984	Aug. 1987	22.9	Feb. 1985	30	21.6	4.4	-22.3	-27.5a	
Apr. 1994	Aug. 2000	17.1	Mar. 1995	64	18.7	4.4	-22.8	-46.8	

a: Market decline ended less than 12 months after boom peak.

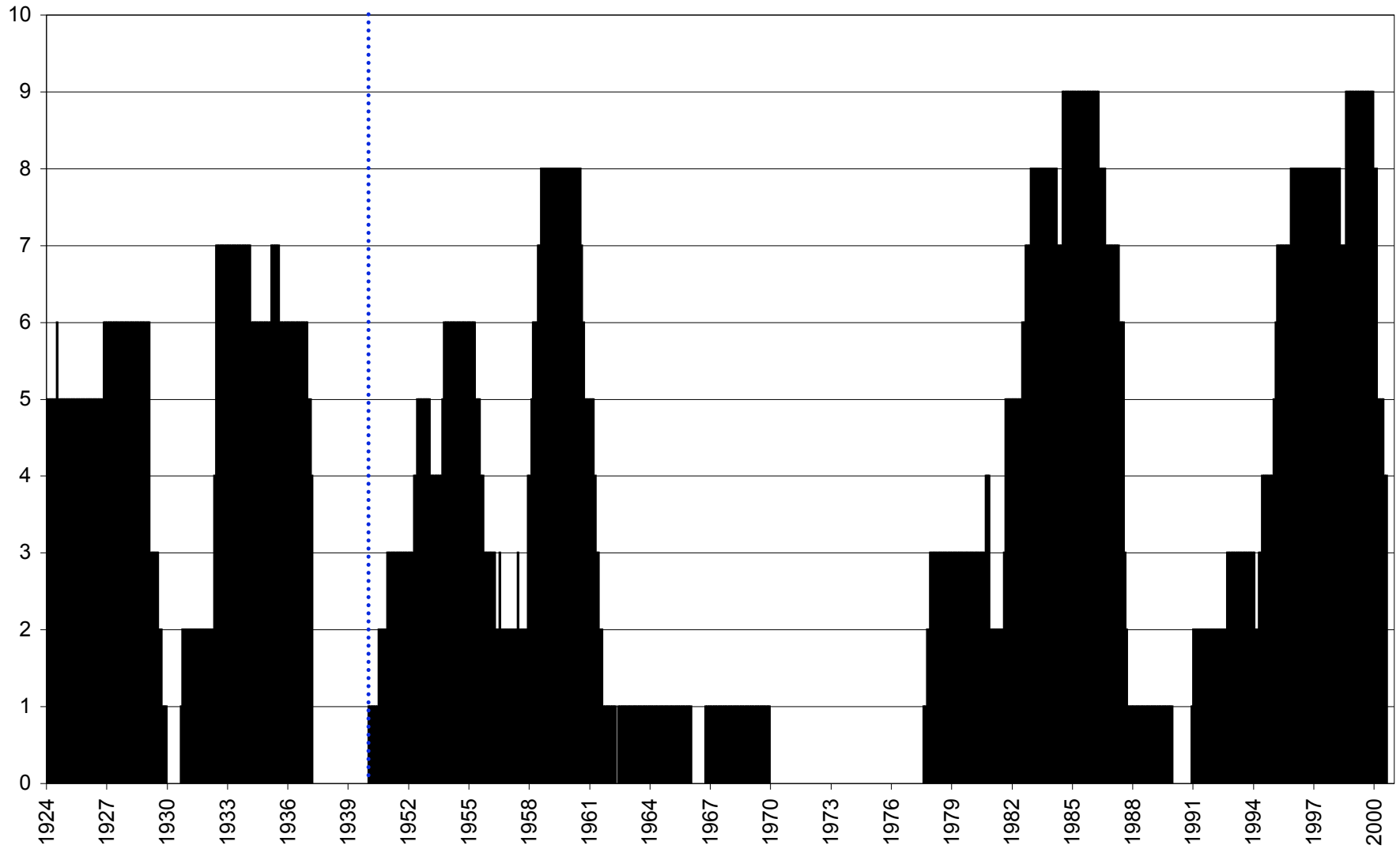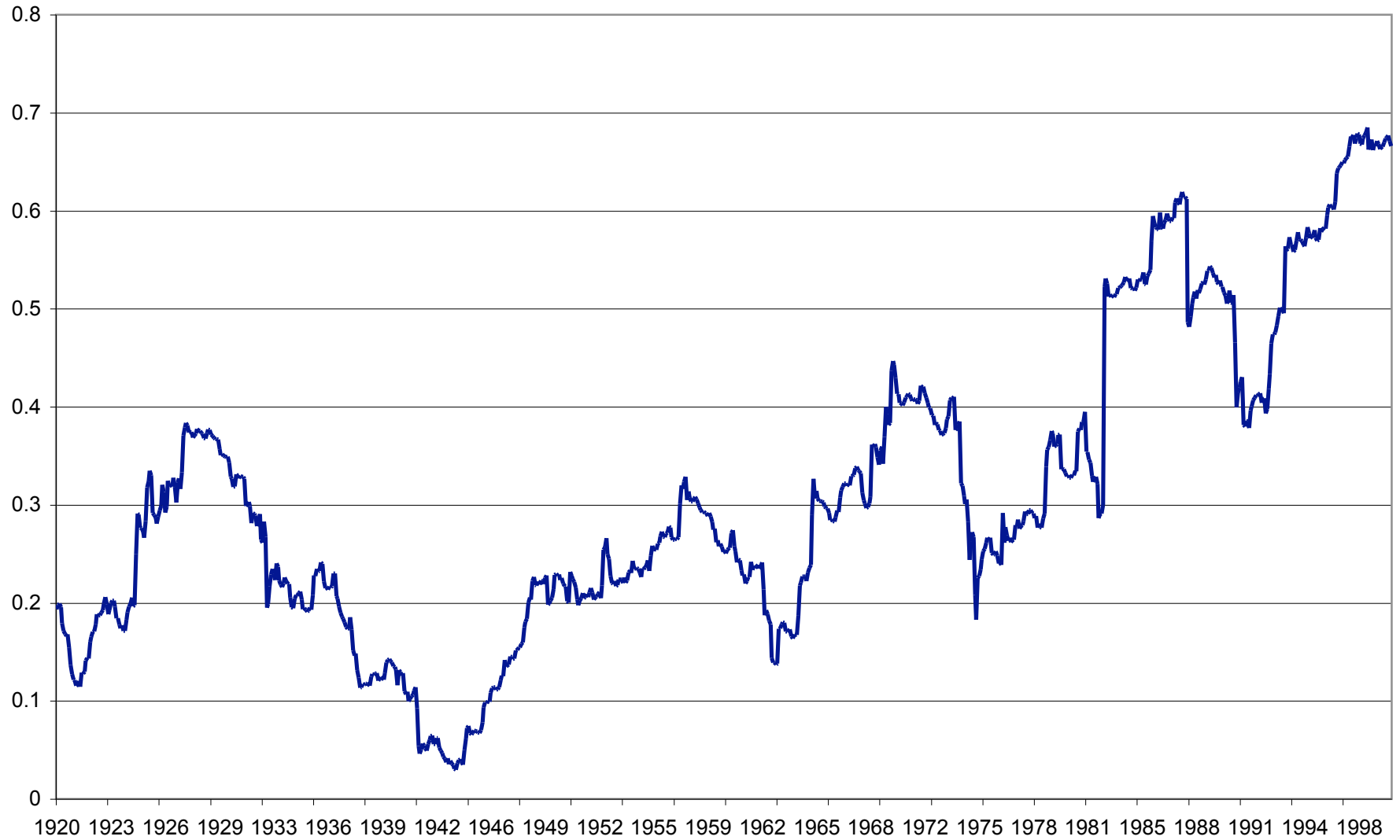**Figure 1: Number of Countries with Ongoing Boom in Given Month, 1924-2000**

Figure 2: Five-Year Moving Average Correlation of Cross-Country Returns

**Figure 3: Real GDP Growth (Minus Long-Run Average) - All 20th Century Booms
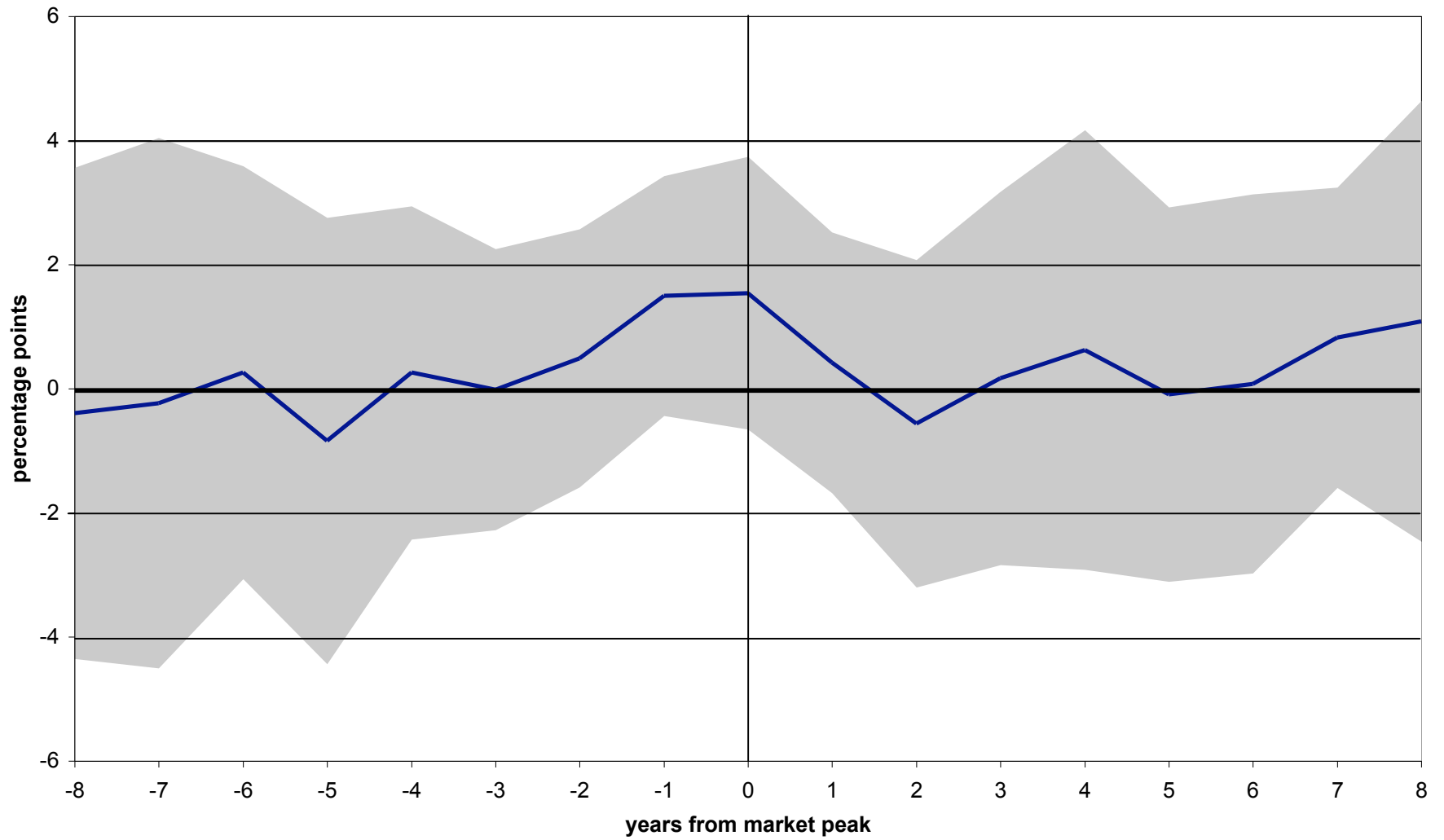Median +/- Mean Absolute Deviation**

**Figure 4: Inflation (Minus Long-Run Average) - All 20th Century Booms
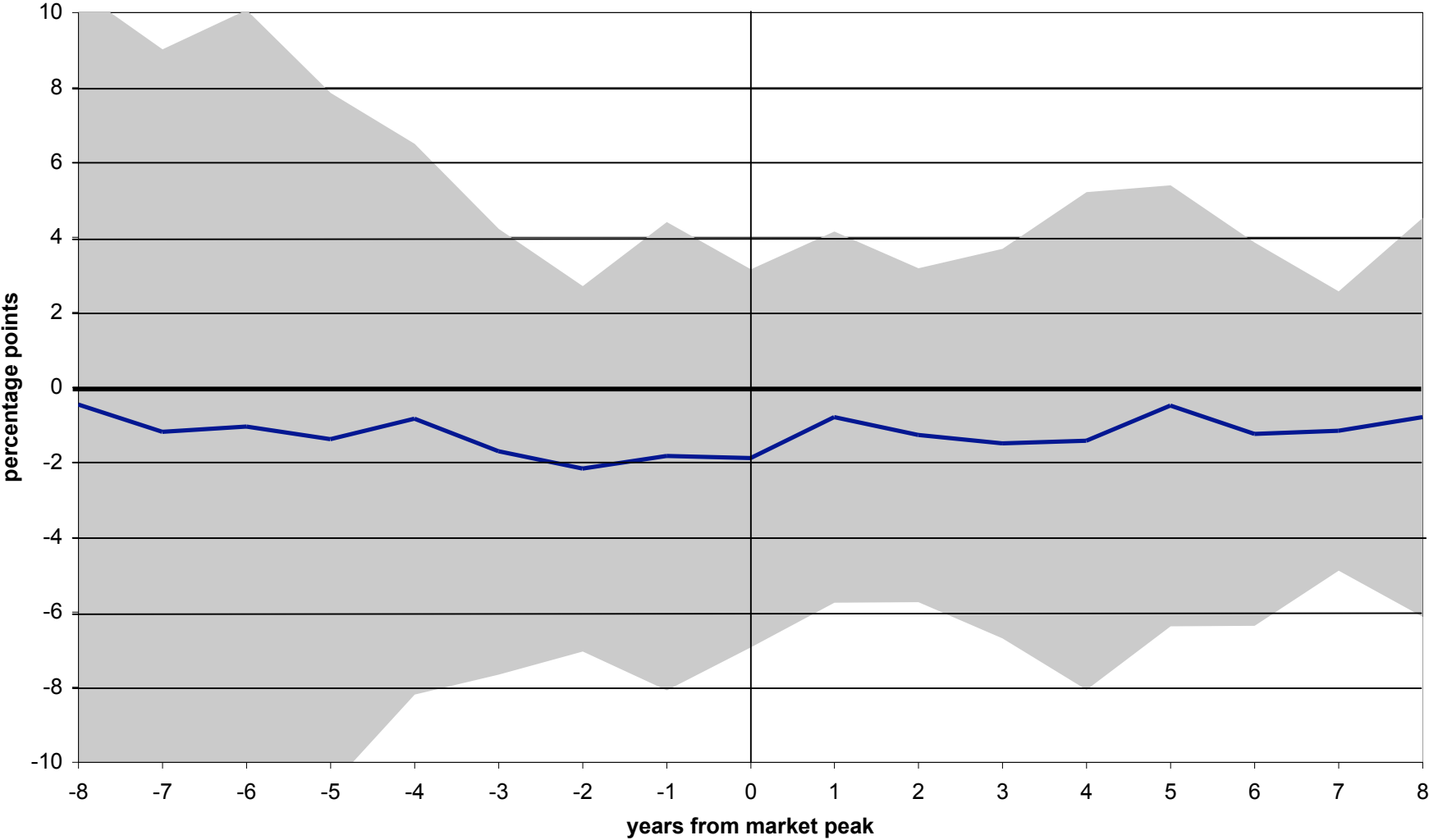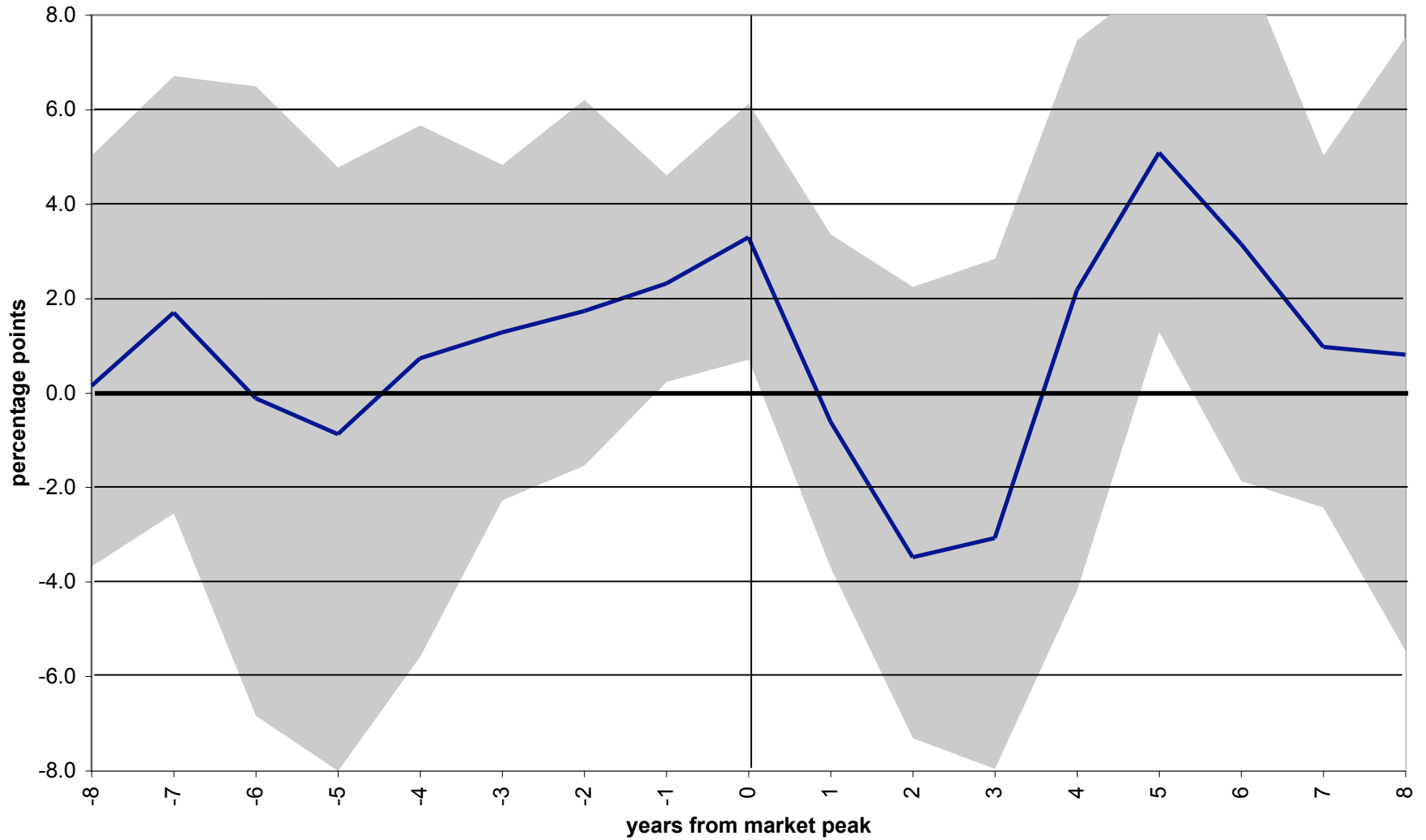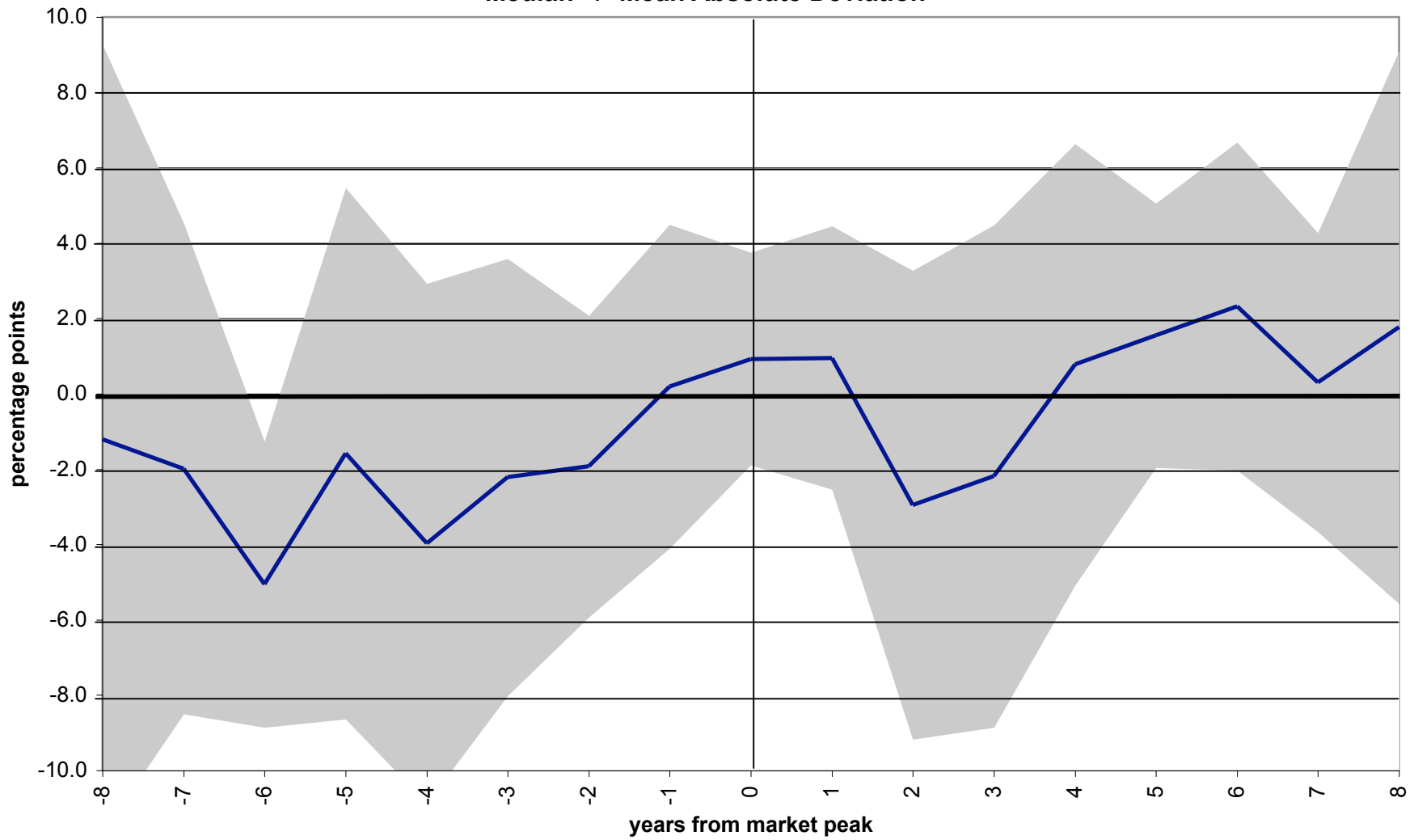Median +/- Mean Absolute Deviation**

Figure 5: Real GDP Growth (Minus Long-Run Average) - Interwar Booms
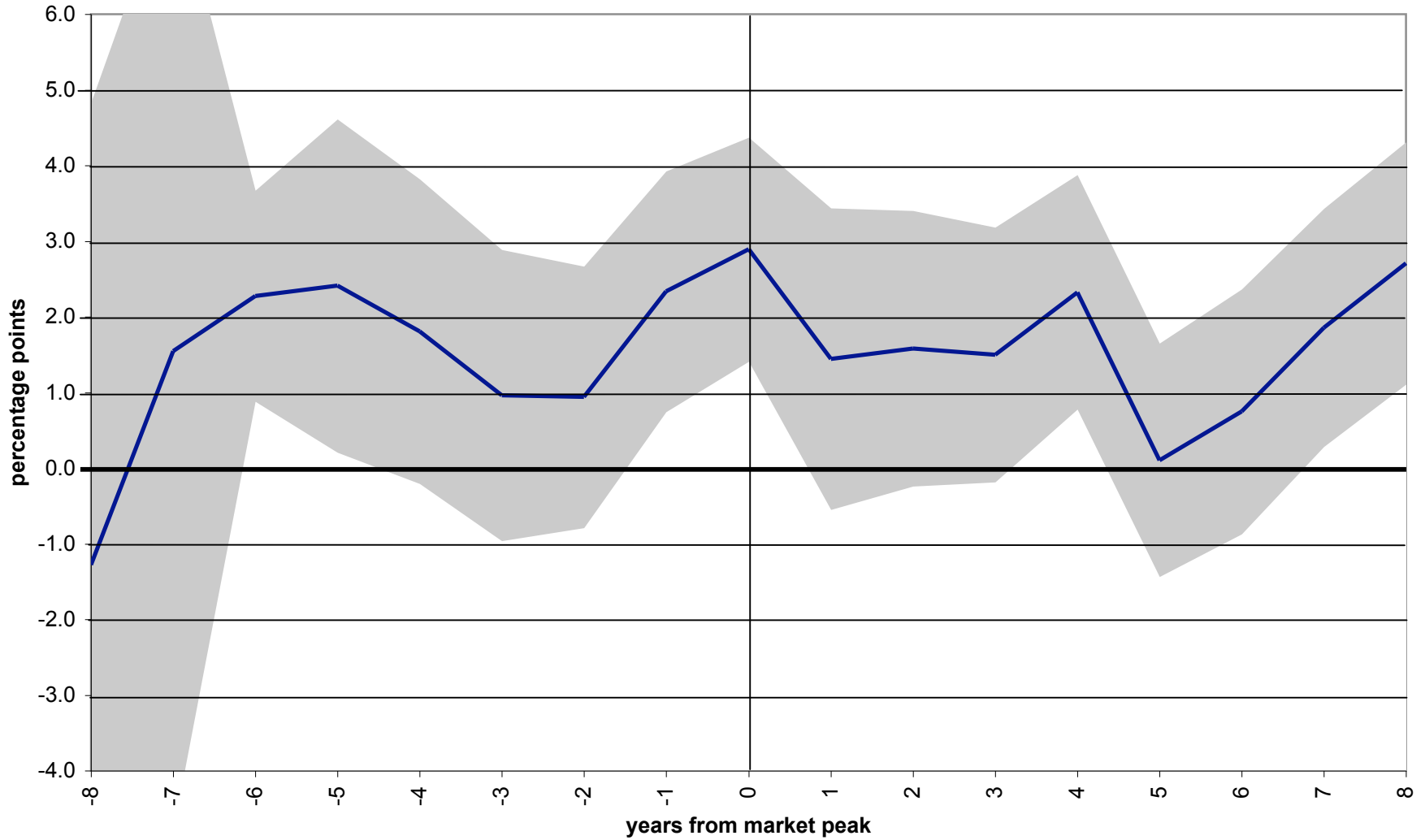**Median +/- Mean Absolute Deviation**

Figure 6: Inflation Rate (Minus Long-Run Average) - Interwar Booms
Median +/- Mean Absolute Deviation

Figure 7: Real GDP Growth (Minus Long-Run Average) - Booms of 1950s-60s
Median +/- Mean Absolute Deviation

**Figure 8: Inflation Rate (Minus Long-Run Average) - Booms of 1950s-60s
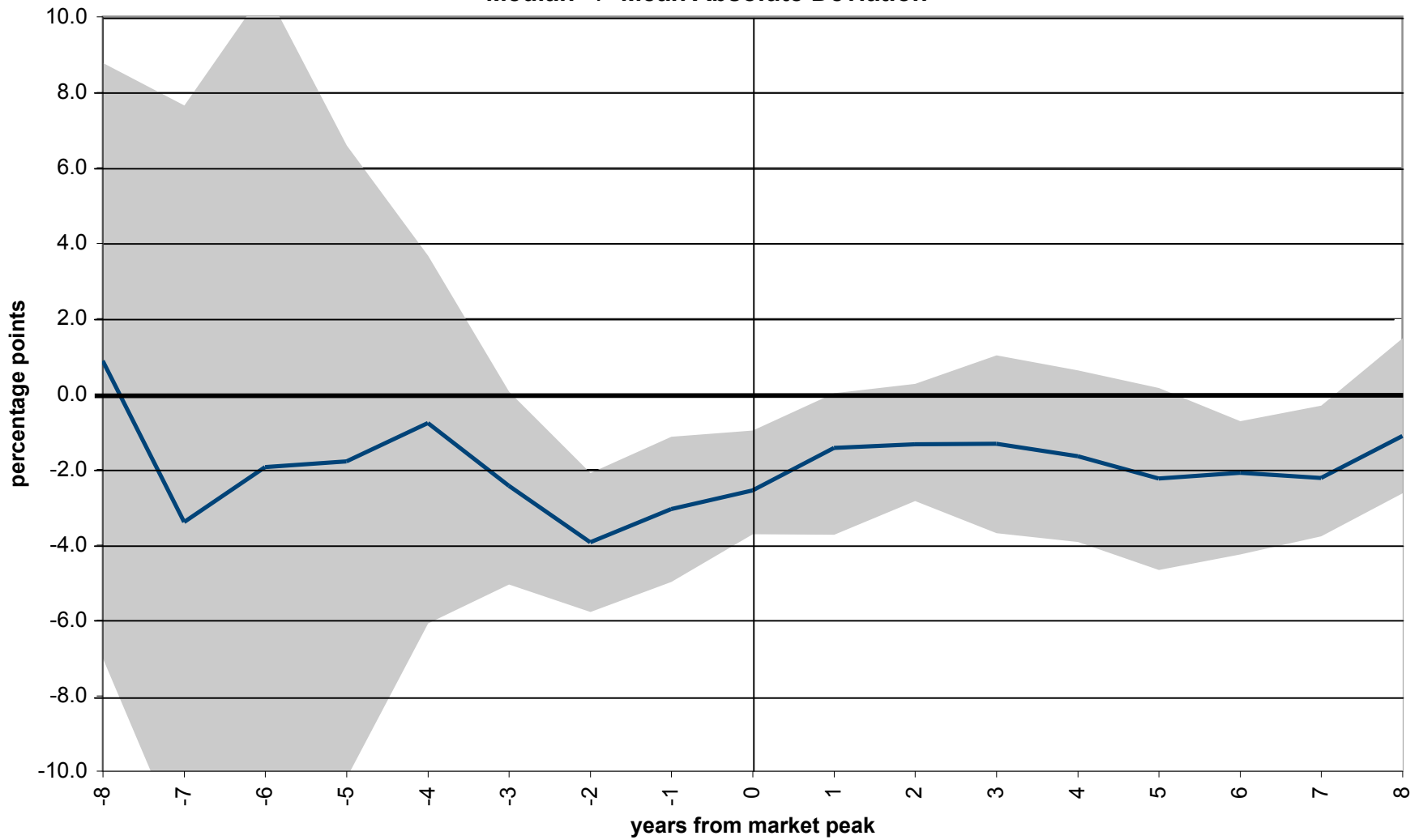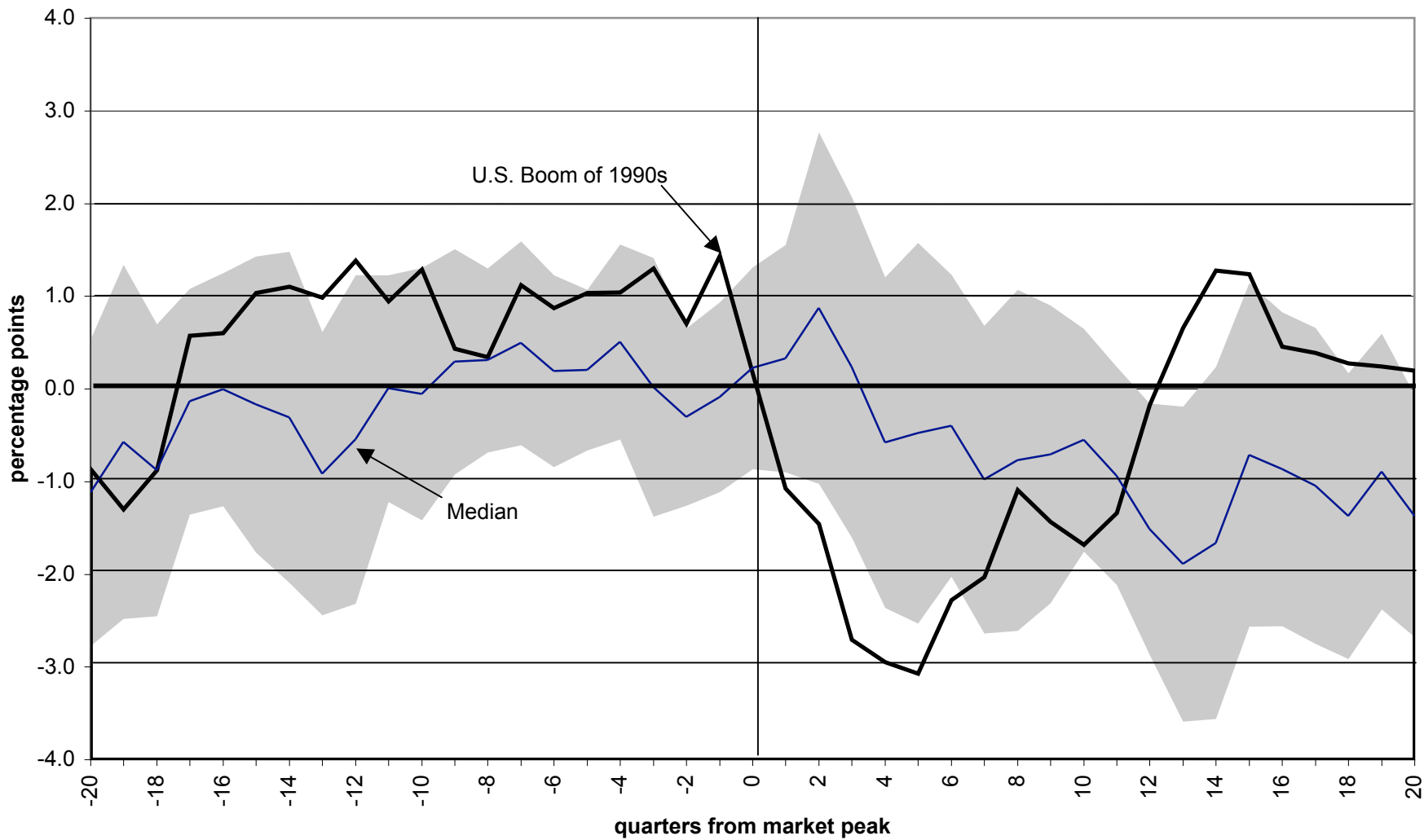Median +/- Mean Absolute Deviation**

**Fig 9: Real GDP Growth (Minus Long-Run Average) - Booms of 1970s-90s
Median +/- Mean Absolute Devation**

U.S. Boom of 1990s

Median

percentage points

quarters from market peak

Fig 10: Labor Productivity Growth (Minus Long-Run Average) Booms of 1970s-90s
Median +/- Mean Absolute Deviation

Fig 11: Inflation (Minus Long-Run Average) - Booms of 1970s-90s
Median +/- Mean Absolute Deviation