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H.C. Wainwright & Co. Economics Inc.

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Interest-Rate Outlook

Research Summary: Gold and non-precious commodities as inflation hedges

Milton Friedman many years ago declared that "inflation is always and everywhere a monetary phenomenon." This surely is one of the most important insights that the monetarists contributed to the field of economics. Inflation is driven by monetary forces, and its barometer is the price of the dollar in the world markets for commodities and foreign exchange.

What inflation is and isn't. The erroneous notion that inflation is driven by ups and downs in "demand" as reflected in unemployment and other cyclical measurements is still alive and well. But this view of inflation doesn't conform to the facts. Professor Friedman's insight means that current inflationary pressures have little or nothing to do with budget imbalances, lagging productivity or "capacity ceilings", all of which are real, not monetary, factors.

This becomes clear when we compare inflation in other countries. Israel, Argentina and many other nations have a much higher inflation rate than the United States. Is inflation in third-world countries high because their industries are closer to their capacity ceilings than their U.S. counterparts? Hardly. Common sense tells us it has more to do with the fact that third-world currencies tend to be weak and to depreciate.

The fallacy in the general misconception of inflation lies in extrapolating from the specific to the general. What is true in relative terms is not necessarily true in the absolute. Although limited capacity in the widget industry drives up the price of widgets relative to other goods and services, it does not follow that the prices of all goods collectively will rise when capacity in general gets tight. It is obviously impossible for the relative prices of goods either to rise or fall *in general*.

In fact, in the absence of a currency there can be no such a thing as inflation or deflation. In a barter economy all price changes are *relative*-price changes and a zero-sum game. If the price of commodity A goes up in terms of commodity B, the price of commodity B must go down in terms of commodity A. The only way there can be across-the-board changes in prices is if all prices are measured in terms of a common unit—the currency.[1]

Leading and lagging indicators of inflation. The most basic mistake made by those who wish to forecast inflation is to work from economic data produced by the government. Practitioners know that the markets for bonds and stocks move much more quickly than economic activity. When we allow for a further delay before the economy can produce unambiguous statistics about itself, it stands to reason that *economic data must be lagging indicators.*

The financial markets, in contrast, produce useful data without any delay. This principle forms the foundation for *Wainwright's* research effort into the predictability of interest-rate movements from commodity prices. Since commodity prices reflect inflationary pressures and inflation is bad news for bonds, commodity prices are leading indicators of bond prices.

The chief research questions we have addressed are which markets provide the most reliable information and how to use them. As the years pass and additional data are available for analysis, gold, platinum and silver continue to be the best commodities for forecasting U.S. interest rates. Other commodities are secondary, but some can also be helpful in forecasting inflation.[2]

Financial markets move and react with great speed. They are rich sources of information partly because trading in such markets is centralized and nearly continuous and partly because the instruments traded are well-defined and more or less uniform. The labor market, a widely watched indicator, has the opposite properties. Labor services are ill-defined and vary from workplace to workplace. Labor market transactions are decentralized, spontaneous and illiquid. It is extraordinary that the cost of labor is so widely regarded as a leading indicator of inflation. It is well known to business cycle analysts that wages and labor costs follow—not lead—the general price level.[3]

1. David Walters, "Inflation is top-down; cost-of-living increases are bottom-up," *The Capitalist Perspective*, H. C. Wainwright & Co., Economics, September 12, 2000.
2. "Which commodity markets are the best interest-rate signals?" *Interest-Rate Outlook*, Wainwright, July, 31, 1998.
3. Richard M. Salsman, "Looking for inflation in all the wrong places," *The Capitalist Perspective*, Wainwright, October 15, 1997.

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Our research has produced a number of principles that govern the suitability of different markets to serve as leading indicators of interest rates and inflation:

- The prices of services are less meaningful than those of goods, whose quantity and quality are easier to measure;
- The prices of consumer goods are less useful than those of producer goods, where trading is more centralized;
- The prices of fabricated products are less useful than those of productive inputs, which are more uniform in composition and traded in more liquid markets;
- The prices of farm products, which are strongly affected by temporary factors like weather, are less useful than those of industrial commodities;
- The prices of perishable commodities, which cannot easily be stored, are less useful than those of metals and other durable items;
- The prices of commodities used predominantly as inputs for production are less useful than those of commodities such as gold, which traditionally are hoarded and used as inflation hedges.

These principles form the bedrock interpretation of what the empirical evidence shows: that the precious metals provide a very powerful leading indicator of interest rates and inflation. For the purpose of anticipating interest-rate movements we have found nothing superior in our many years of work in this area.

Forecasting official indices of inflation. Although interest rates are easy to measure, inflation is not. There is no perfect index of inflation, only a collection of imperfect snapshots that the government publishes for differing cross-sections of economic activity. Prices must be collected from a wide variety of sources using a very expensive measurement procedures, leading statisticians to cut corners in their attempt to guage inflation cheaply and quickly.[4] The behavior of the consumer price index reflects the weighted average of its components, with the largest segments carrying the greatest weight. Those commodities such as industrial metals, oil and food that play a substantial role in the economy are *automatically* correlated with the measured rate of inflation.

Precious metals do not have this property because their economic role lies less in production and consumption than in wealth preservation. Despite that, they are better at forecasting inflation than a wide range of other commodities.

We have assembled a database of market-price indicators that have been, or could be, used as inflation signals. They include commodities and commodity indices, as well as other markets such as foreign exchange.

In the following tables, we report and rank the degree of correlation between movements in these indicators

Table 1

How Commodities Forecast Inflation

From 1968

	correlation between commodity-price change and following-year change in:	
	consumer prices	*producer prices (all commodities)*
Gold	0.71	0.76
Silver	0.66	0.63
Journal of Commerce index	0.62	0.71
Raw industrial materials	0.58	0.68
Bridge CRB index	0.58	0.68
Platinum	0.55	0.55
Tin	0.53	0.55
Lead scrap	0.53	0.46
Rubber	0.48	0.64
WTI crude oil	0.48	0.37
Foodstuffs	0.47	0.55
Copper scrap	0.42	0.54
Steel scrap	0.41	0.39
Zinc	0.37	0.31
Rosin	0.37	0.26
Wool tops	0.37	0.56
Burlap	0.35	0.30
Tallow	0.32	0.45
Print cloth	0.30	0.37
Cotton	0.29	0.48
Hides	0.24	0.40
Foreign exchange (euro, yen, pound)	0.20	0.43

Data: Calendar-year averages of monthly indices of consumer prices and of producer prices for all commodities (Bureau of Labor Statistics) and of monthly prices for industrial commodities (*Journal of Commerce*), individual industrial commodities, crude oil and foodstuffs (Bridge Commodity Research Bureau), precious metals (*Metals Week/Wall Street Journal)* and foreign exchange (Federal Reserve Board).

4. For comments on systemic measurement errors in the consumer price index, see "Zero inflation, understated growth," *Economic and Investment Observations*, Wainwright, August 26, 1992.

and subsequent movements in inflation and interest rates.

The most useful time horizon for forecasting interest-rate movements is the longest. The longest that we have found to be feasible is twelve months. Calculations using shorter horizons of six and three months produce generally higher correlations for many commodities, but they provide a much less stringent test for discriminating among different commodities. The precious metals are an exception; their forecasting power is weakened—both relatively and absolutely—by shortening the forecast horizon. The comparative advantage of the precious metals lies partly in the early warning they provide.

Table 1 shows how well each of more than 20 commodity-price indicators forecasts inflation as measured by both consumer and producer prices.

Forecasting long-term interest rates. Table 2 shows how movements in the prices of a variety of commodities correlate with movements in the Treasury bond market twelve months in the future. As shown, an equally weighted basket of platinum, gold and silver forecasts the bond market with the highest degree of confidence, overshadowing the other commodities. Even a rise in oil prices, which directly pushes up the cost of living, is only a weak predictor of inflation or interest rates twelve months out.

Table 2 also includes a statistic known as the "partial correlation coefficient" for each non-precious commodity. This measures the correlation between changes in each commodity price and future bond-yield movements after the implications of changes in precious-metals prices have already been allowed for. Most are insignificant.

Partial correlations are quite different from simple correlations. For example, the simple correlation coefficient for changes in the raw industrial materials index and the following year's T-bond yield movements is 0.40, a figure that is positive and significant. But the partial correlation coefficient with the component of T-bond behavior that is unexplained by changes in precious-metals prices is –0.13. This measure of the marginal forecasting contribution made by raw industrial materials is negative, small and insignificant. Thus it is not possible to improve on a forecast of future interest-rate movements by including industrial commodity index data along with precious-metals prices.

If these two commodity inputs are reversed, however, the result is quite different. When we measure the correlation between precious metals and future bond-yield movements after the implications of changes in the industrial-commodities index have been allowed for, we get a partial correlation coefficient for the precious metals of 0.73. This indicates a hefty contribution indeed.

Given the strength of the relationship it seems inconceivable that the precious metals are not widely depended on by investors to predict bond behavior. Yet their use is con-

Table 2

Which Commodities Best Forecast the Bond Market

The Precious Metals Are the Commodities that Count

From 1968

	correlation between commodity-price change and following-year change in T-bond yields	
	simple correlation	*partial correlation*
Three precious metals	0.76	
Silver	0.70	
Gold	0.70	
Platinum	0.66	
Journal of Commerce index	0.48	-0.02
Lead scrap	0.46	0.03
Rubber	0.42	0.00
Raw industrial materials	0.40	-0.13
Five industrial metals	0.38	-0.18
Bridge CRB index	0.37	-0.19
Foreign exchange (euro, yen, pound)	0.36	-0.08
Cotton	0.33	0.02
Copper scrap	0.33	-0.11
Burlap	0.32	-0.13
Tin	0.29	-0.18
Rosin	0.28	-0.05
Foodstuffs	0.27	-0.21
WTI crude oil	0.25	-0.33
Print cloth	0.24	0.00
Steel scrap	0.22	-0.14
Hides	0.21	0.18
Wool tops	0.18	-0.06
Tallow	0.18	-0.10
Zinc	0.09	-0.18

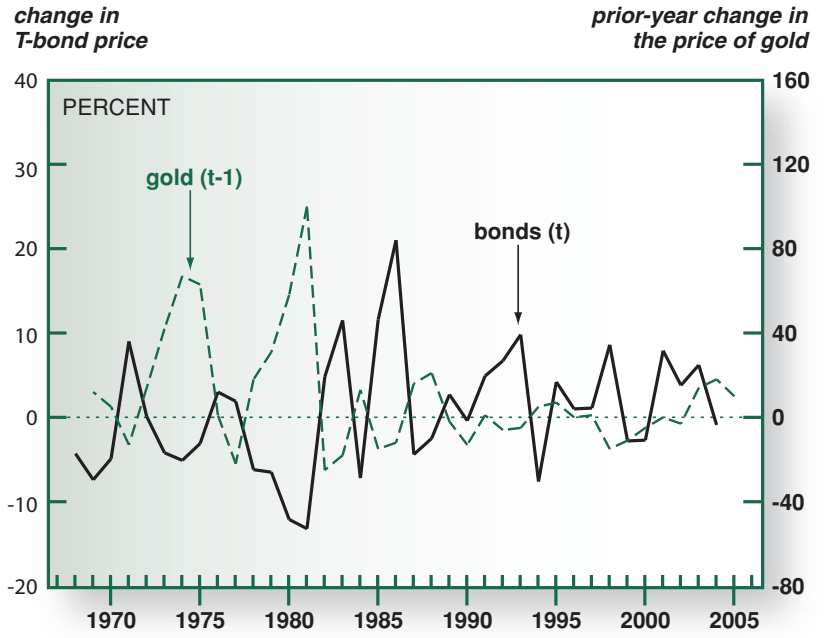
Data: As for Table 1, together with calendar-year averages of 10-year Treasury bond yields (Federal Reserve Board).

Source: Updated from "Industrial commodities are *not* signaling another increase in interest rates," *Interest-Rate Outlook*, Wainwright, September 15, 1999, Table 5, p. 5.

Figure One

When Gold Zigs, Bonds Zag

from 1968



troversial. The prevailing mindset is that although the precious metals may have played a role in financial markets in times past, their value has diminished to nearly zero in the age of paper and one-year electronic money. But as Figure One illustrates, the year-over-year change in the price of gold leads changes in bond prices by one year in a consistent pattern right up to the present.

Forecasting short-term interest rates. Table 3 repeats the exercise to show the effectiveness of various commodities for forecasting the Treasury bill and federal funds rates one year ahead.

As with the bond market, movements in commodity prices play a role, but it is a much murkier picture. Precious metals still dominate, with gold having the highest correlation.

Hedging against inflation. One of the oldest investment strategies is to escape into hard assets when inflation threatens. This may be feasible for equity investors, but fixed-income investors choices are more limited. They can shorten the duration of their portfolios or substitute index-linked bonds such as TIPs for regular bonds. Or, if permitted, they might consider investing in commodities.

Gold is the most traditional of all hedges against inflation. The real value of the principal is more secure than any known alternative, and it produces capital gains in inflationary times. But as with other physical commodities, gold produces no current income, and there are many drawbacks to owning the asset itself.

These disadvantages can be overcome through the use of the gold loan market (producing current income for the owner) or the derivatives market (avoiding direct costs of physical ownership). In recent years Wall Street has brought to the market some more diverse and conveniently "investible" alternatives.

The evidence shows that the price of gold is very sensitive to inflation, much more so than index-linked bonds. Indeed, a given amount of inflation raises the price of gold more than six times as much as it lowers the price of a long Treasury bond. We have calculated that a fixed-income portfolio could remain immune to the bond-market damage done by inflation with an allocation to gold of as little as 18 percent.[5]

Does gold work *too* well? Ironically, however, the very sensitivity and early-warning properties of gold could be a disadvantage. Inflation does not accelerate forever; sooner or later it will recede, and at such a time the price of gold can drop without warning—long before investors realize that the economic situation has changed. Symmetrically the use of gold is also a challenge at the beginning of the inflation cycle when the price is likely to rise well before investors wake up to the fact that inflation is returning.

Non-precious commodities offer an escape from this dilemma, because their prices tend to move in the same direction as gold but after a time lag of several months. This suggests a two-fold strategy for investors. They can rely on gold and/or silver and platinum as leading indicators on which to base the timing of their inflation-hedging decisions. But they should choose non-precious commodities when they seek a commodity-based vehicle for hedging against inflation.

Separating energy bets from inflation bets. Perhaps the best-known investible vehicle derived from commodity markets is the Goldman Sachs Commodity Index (GSCI), a weighted index of 24 commodity markets of which six are energy-related: crude oil, Brent crude, unleaded gasoline, heating oil, gas oil and natural gas. This heavy participation in energy presents a problem. Although this index is billed as "highly diversified", the degree of diversification in fact depends on the component weights, which are proportionate to world production in terms of dollars.[6]

5. "How much gold it takes to immunize a bond portfolio against inflation," *Interest-Rate Outlook*, Wainwright, December 24, 2003.
6. For a critique of this index as an inflation hedge, see "The Goldman Sachs Commodity Index: forecasting input or forecasting target?" *Interest-Rate Outlook*, Wainwright, September 27, 2003.

Table 3

Which Commodities Best Forecast Short-term Interest Rates

The Precious Metals Win Again

From 1968

	correlation between commodity-price change and following year change in:	
	T-bill rate	*fed-funds rate*
Three precious metals	0.56	0.50
Gold	0.53	0.46
Silver	0.51	0.44
Platinum	0.50	0.47
Foreign exchange (euro, yen, pound)	0.46	0.46
Wool tops	0.43	0.48
Rubber	0.41	0.40
Hides	0.40	0.46
Journal of Commerce index	0.38	0.31
Copper scrap	0.35	0.33
Raw industrial materials	0.34	0.30
Lead scrap	0.32	0.25
Cotton	0.31	0.35
Burlap	0.27	0.19
Bridge CRB index	0.27	0.21
Tin	0.23	0.11
Five industrial metals	0.20	0.10
Tallow	0.15	0.14
Foodstuffs	0.12	0.06
Print cloth	0.06	0.04
Steel scrap	0.06	0.14
WTI crude oil	0.06	0.17
Zinc	0.06	0.15
Rosin	0.04	0.09

Data: As for Table 1, together with calendar-year averages of daily rates on federal funds and 3-month Treasury bills (Federal Reserve Board).

Unfortunately, these weights are highly sensitive to price changes in the components of the index. Diversification can thus be lost when unusual price changes shift the weights. For example, as of September 1, 2005 the six energy markets had a combined weighting approaching 80 percent owing to the escalation of energy prices. To use such an index in an investment portfolio would be an excellent hedge against further rises in energy prices, but it would be a dubious hedge against inflation in general. It would be vulnerable to a snapback in energy prices, such as we have already experienced.

We therefore prefer another index published by Goldman Sachs from which energy markets have been excluded. The remaining markets (in order of weighting) are: live cattle, corn, wheat, aluminum, copper, soybeans, lean hogs, gold, sugar, cotton, red wheat, feeder cattle, nickel, coffee, zinc, lead, cocoa and silver.[7] Although this index contains gold and silver and gives high weight to agricultural commodities, items that we might prefer to exclude, we adopt it for the purposes of this report.

Table 4 (following page) ranks a variety of commodity-price data according to the average time lag between annual price movements in each commodity measure and the annual performance of T-bonds, our preferred benchmark for inflation. The table also reports the correlation at the "optimal" time lag for each commodity price indicator. The Goldman Sachs ex-energy index and the overall GSCI index are both included.[8]

Table 4 shows that the inflation-hedging properties of the ex-energy index are intermediate between those of the precious metals (high correlation with bonds and long lead times) and those of the GSCI (low correlation with bonds and no lead time). Thus the ex-energy index leads the bond market six months earlier than the overall GSCI index, but is also considerably more closely correlated with future changes in bond yields. These results suggest that combining energy and non-energy commodities into a single index is inefficient for the purpose of inflation hedging, because energy prices move roughly contemporaneously with bonds while non-energy prices move several months in advance.

Inflation-hedging a T-bond portfolio. We calculate from the same data that about 30 percent of a portfolio of long Treasury bonds would have to be diverted to commodities such as those represented by the Goldman Sachs ex-energy index in order to exploit fully the available protection against inflation damage. Table 5 compares the returns of such a mix with those of T-bonds and commodities considered separately. The suggested mix of T-bonds and industrial commodities has both higher average returns and lower volatility than either Treasuries or commodities alone.

7. See website www.gs.com/gsci.
8. The correlations in Table 4 are not quite the same as in Table 2, because the limited history of the GSCI requires beginning the calculations in 1974 rather than 1968.

Table 4

Where to Get the Earliest Warning Inflation Signals from Commodity Markets

From 1974

Commodity price indicator	*Lead time relative to T-bonds in months*	*Correlation with changes in T-bond yields*
Platinum	16	0.751
Silver	14	0.760
Gold	12	0.727
Three precious metals (chained median index)	13	0.790
GSCI ex energy	6	0.430
Commodity Research Bureau spot index	4	0.491
CRB index of raw industrial materials prices	4	0.452
Brent crude	1	0.540
GSCI overall index	0	0.293

Data: Calendar-year averages of month-average yields on 10-year Treasury bonds (Federal Reserve Board) and commodity prices (*Metals Week, Reuters/Bridge Commodity Research Bureau,* and the *Wall Street Journal*); and of month-end commodity prices indices (Goldman Sachs). The monthly chained-median index of three precious metals prices is published by H.C. Wainwright & Co. Economics Inc.

Investment implications. Industrial commodity prices are widely relied upon by economists and investors as leading indicators of inflation and interest-rate movements. Although they do have forecasting power, it is greatly inferior to that of precious-metals prices. Even more important, when these two commodity groups are at odds, the significance of the precious-metals market signal completely dominates that of the industrial commodities. Once precious-metals prices have been taken into account, industrial commodity prices contribute next to nothing to a one-year-ahead forecast of either long-term or short-term interest rates.

Table 5

Calendar-year Returns From a Mix of T-Bonds and Investible Non-Energy Commodities

investment vehicle	*Mean comound annual return*	*volatility*	*Highest annual return*	*Lowest annual return*
Long Treasuries	9.1	11.8	40.0 (1982)	-9.0 (1999)
GSCI ex energy	8.9	19.9	75.0 (1973)	-23.0 (1998)
70% T-bonds & 30% GSCI ex energy	9.6	9.0	32.0 (1982)	-7.0 (1999)

Data: as for Table 4. Volatility refers to the standard deviation of annual return. The mix in line 3 is rebalanced at the end of each calendar year.

For purposes of forecasting interest rates one year into the future, the precious metals overshadow even broad market baskets such as those published by Bridge Commodity Research Bureau and the *Journal of Commerce.*

Commodities are highly volatile, and bonds are highly sensitive to inflation. However, when combined in the right proportions, the two asset classes can be transformed into an asset that resembles bonds but with far lower volatility and without any sacrifice of long-term return. Better yet, if the commodity index used to create this asset is derived from non-precious commodities, its performance can be anticipated several months in advance by using the prices of the precious metals as leading indicators.

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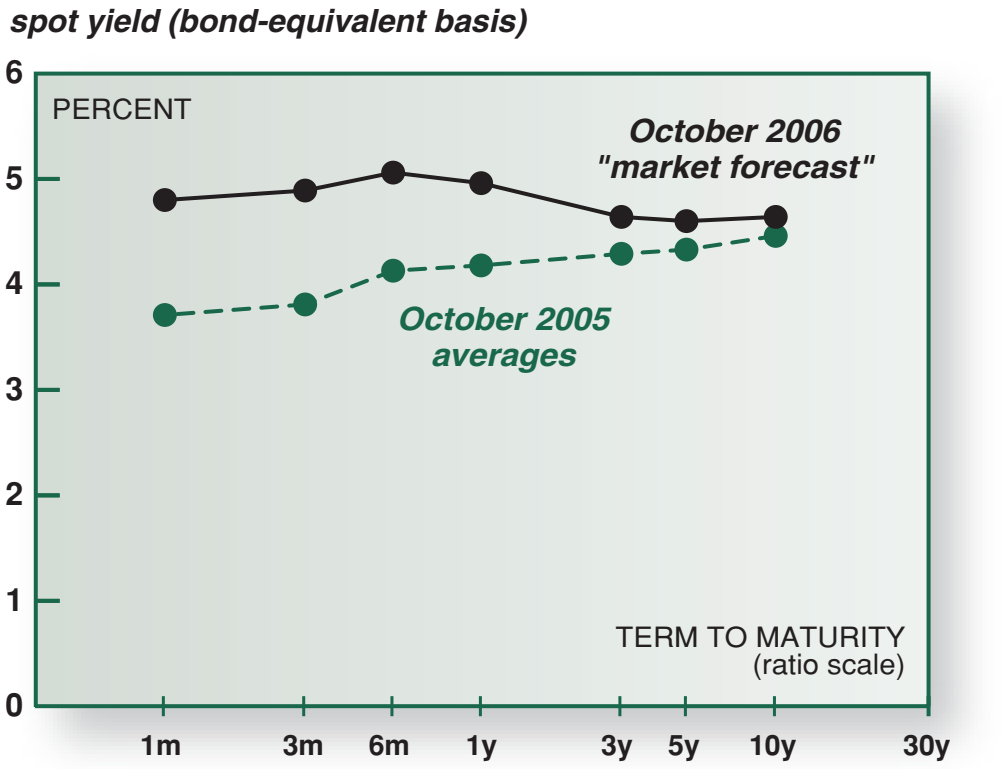
Appendix

The U.S. Treasury Yield Curve

"Market forecasts" of change 12 months ahead

Investment Conclusion: Interest rates rising across the board.



	bond-equivalent yield						
		forecast	directional confidence				
maturity	average 10/05	12-month change	increase	decline	price change	income	total return
10 years	4.46%	12 b.p.	59%		-1.4%	4.4%	3.0%
5	4.33	20	62		-1.2	4.3	3.1
3	4.29	27	63		-1.0	4.3	3.3
1	4.18	60	72		-0.8	4.2	3.4
6 months	4.13	72	75		4.6	0.0	4.6
3	3.81	75	77		4.3	0.0	4.3
1	3.71	82	76		4.2	0.0	4.2
overnight*	3.87	104	82				

*federal funds

Note: 30-year yield data no longer available from the Fed.

Data: Calendar-year averages of daily precious-metals prices (*Metals Week/Wall Street Journal*) and the monthly consumer price index for all urban consumers (Bureau of Labor Statistics).

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