Working Paper

HISTORICAL RETURNS OF STOCKS, BONDS, BILLS AND INFLATION IN THE SPANISH CAPITAL MARKETS

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Abstract

This article presents and analyzes historical financial data on Spanish capital markets. The Spanish data base is compiled following the methodology used by Ibbotson and Sinquefield for the United States. A similar study of Japanese financial markets has been carried out by Yasushi Hamao. We take advantage of these authors' research to compare U.S., Japanese, and Spanish capital markets.

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Introduction

Since the 1960s, academics have studied and compared the performance of financial assets throughout the world. Lawrence Fisher and James Lorie (1964, 1968, 1977) published several series of historical annual returns for common stocks, originally from 1926 to 1963, later updated to 1965 and, finally, to 1976. Roger G. Ibbotson and Rex A. Sinquefield (1976, 1977, 1982, 1989) and Ibbotson Associates (1984-1992) constructed similar annual returns from 1926, originally to 1974, and currently updated annually, quarterly, and monthly. Charles P. Jones and Jack W. Wilson (1987) extrapolated the Ibbotson & Sinquefield series backwards to 1870 and compared it with Ibbotson and Sinquefield's similar series for the period 1926-1985. Yasushi Hamao (1991) presented the returns on common stocks, long-term corporate bonds, and long-term government bonds, short-term interest rates and capital market inflation in Japan from 1971 to 1987. Laurence B. Siegel and Paul D. Kaplan (1989) compared the results of studies conducted or inspired by Ibbotson and Sinquefield in six countries: the United States, the United Kingdom, France, Switzerland, Canada and Japan.

The purpose of this paper is to construct and analyze historical returns of Spanish capital markets. The series we present here are:

1. Common stocks - Madrid Stock Exchange
2. Medium and long-term government debt
3. Medium-term corporate bonds
4. Treasury bills, and
5. Inflation

We also derive new series representing the component parts of asset returns. They include inflation adjusted returns, bond horizon premium, equity risk premium, and bond default premium.

Basic series

A. Notations and definitions

The wealth index, W(T), is the value at month T of an initial investment of 100 pesetas. The formula used is the following:

$$W(T) = 100 * \prod_{t=1/41}^{T} [(1+r_t)]$$

where:

W(T): value of wealth at month T
r_t: return of month t
t: starting date for the index

The following abbreviations are used for the indices:

MSE = Madrid Stock Exchange index
LGB = Long-term government bond index
TBI = Treasury bill index
CBI = Corporate bond index
CPI = Consumer price index

Monthly returns[1] are calculated using the wealth indices and applying the following formula:

$$r_t \quad \frac{WC1r) - 1}{W(T-1)}$$

where,

r_t = return of month t
W(T) = wealth index at month T
W(T-1) = wealth index at month T-1

Annual returns[1], R_t, are compounded from monthly returns, r_t, using the following formula:

$$R_t = [(1+r_{jt})(1+r_{ft})\ldots (1+r_{dt})]-1$$

where,

R_t: annual return
d_t: January return of year t.
r_{ft}: February return of year t...

In order to facilitate comparisons, the MSE index was converted into U.S. dollars using the following formula:

$$I_{t,\$} = \frac{It * Ct}{I_{1970}*C_{1970}} *100$$

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[1] Annual and monthly returns do not take into account transaction costs or taxes.

where:

$I_{t,\$}$: Madrid Stock Exchange index of period t, translated into U.S. dollars.
I_t: Madrid Stock Exchange index of period t, in pesetas.
C_t: Spot peseta/U.S. dollar exchange rate at the end of month t.
I_{1970}: Index at December 1970.
C_{1970}: Spot peseta/U.S. dollar exchange rate at the end of December 1970.

B. Common stocks (1941-1990)

There are four stock exchanges in Spain: Madrid, Barcelona, Bilbao and Valencia. The Madrid stock exchange accounts for 77.9% of the entire market value.

In this article we use the MSE index in its two versions: "price return" and "total return". The price return index measures only capital appreciation, while the total return index considers also dividends and cash-inflow to shareholders from the preemptive rights issued with new equity (all tables shown in the article refer to "total indices", except Table 1, which refers to both indices). Both indices have been formed by grouping together the indices of the different sectors. Each sector has been given a weight according to the relationship between its market capitalization and the market as a whole.

Table 1 shows the price and total annual returns of Spanish common stock for the period 1941-1990. In order to compare with other Spanish financial assets, the MSE index is initialized in December 1988, and to compare with U.S. and Japanese common stocks, in December 1970. For these last series, we use monthly data.

Table 1.
Madrid Stock Exchange: Price return and total return indices and Consumer Price Index
December 1940=100

Date December	Nominal Price Return Index	Nominal Total Return Index	CPI	Infl. Adj. Price Return Index	Infl. Adj. Total Return Index
1940	100.000	100.000		100.000	100.000
1941	135.371	138.928	122.500	110.506	113.410
1942	143.807	150.511	121.800	118.068	123.572
1943	117.798	127.662	124.700	94.465	102.375
1944	141.154	156.820	129.100	109.336	121.471
1945	147.289	168.426	146.700	100.401	114.809
1946	234.607	274.719	200.300	117.127	137.153
1947	256.168	304.242	220.100	116.387	138.228
1948	180.274	220.111	229.600	78.516	95.867
1949	162.906	205.777	247.300	65.873	83.209
1950	174.406	228.127	278.100	62.713	82.030
1951	199.105	270.024	286.100	69.592	94.380
1952	205.418	289.914	281.700	72.920	102.915
1953	217.526	320.703	284.700	76.405	112.645
1954	275.388	423.901	294.200	93.605	144.085
1955	404.160	643.545	306.700	131.776	209.828
1956	544.951	891.955	332.400	163.944	268.337
1957	466.547	787.667	376.400	123.949	209.263

Table 1 (continued)

Nominal Date December	Nominal Price Return Index	Total Return Index	CPI	Infl. Adj. Price Return Index	Infl. Adj. Total Return Index
1958	428.201	750.373	421.100	101.686	178.193
1959	371.193	678.260	437.300	84.882	155.101
1960	387.463	741.875	440.200	88.019	168.531
1961	511.845	1,024.106	449.000	113.996	228.085
1962	590.500	1,224.048	496.000	119.052	246.783
1963	573.061	1,229.418	520.800	110.034	236.063
1964	596.604	1,322.942	591.300	100.897	223.734
1965	639.787	1,467.578	646.400	98.976	227.038
1966	661.466	1,571.757	680.100	97.260	231.106
1967	664.515	1,641.172	723.400	91.859	226.869
1968	875.336	2,233.814	744.000	117.652	300.243
1969	1,330.489	3,478.852	768.900	173.037	452.445
1970	1,174.716	3,153.496	821.000	143.083	384.104
1971	1,353.461	3,739.150	900.200	150.351	415.368
1972	1,785.456	5,061.981	966.600	184.715	523.689
1973	2,028.354	5,877.435	1,104.000	183.754	532.453
1974	1,820.320	5,402.127	1,301.000	139.884	415.133
1975	1,897.114	5,791.744	1,485.000	127.768	390.068
1976	1,339.623	4,235.625	1,778.000	75.329	238.178
1977	906.713	3,035.200	2,248.000	40.334	135.017
1978	815.323	2,916.156	2,614.000	31.194	111.574
1979	686.627	2,655.936	3,021.000	22.725	87.903
1980	730.861	3,110.889	3,482.000	20.988	89.335
1981	912.790	4,224.048	3,985.000	22.905	105.995
1982	746.337	3,797.791	4,564.000	16.352	83.209
1983	877.779	5,003.736	5,102.000	17.204	98.072
1984	1,256.993	7,647.303	5,561.000	22.602	137.506
1985	1,704.630	10,940.291	6,014.000	28.343	181.908
1986	3,553.871	23,619.809	6,527.000	54.445	361.853
1987	3,876.161	27,720.089	6,828.000	56.771	405.993
1988	4,687.150	34,568.475	7,224.000	64.885	478.541
1989	5,032.541	38,156.682	7,721.000	65.176	494.166
1990	3,802.559	29,727.490	8,239.000	46.154	360.824

C. Government debt (1988-1990)

The development of a liquid government debt market in Spain is a very recent phenomenon. Until 1987, most government issues were "*Pagarés del Tesoro*"[2]. In 1990, "*Pagarés del Tesoro*" and Treasury bills continued to be the main source of government funding, accounting for 73.4% of outstanding government debt. Between 1987 and 1990, medium and long-term government debt increased 40.7% due to the determination of the

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[2] *Pagarés del Tesoro* are short-term government debt instruments. They were attractive until the mid 1980s, when Act 14/1985 of May 29 established that *Pagarés del Tesoro* were to be exempted from withholding tax, thus allowing the Treasury to reduce issue prices. As a result, banks lost interest in these instruments and confined themselves to acquiring the volume they needed to satisfy legal requirements.

Bank of Spain and the Madrid Stock Exchange in contributing to the disclosure and liquidity of the different markets.

1. *Medium and long-term government debt.* Long-term government bonds are issued in "bearer" form. They have a face value of 10,000 pesetas and there is a withholding tax of 25% levied on the annual coupon.

   There are two instruments through which the government can finance its long-term requirements: notes and bonds. Notes are three to five-year instruments; three-year notes are issued every month, while five-year notes are issued every two months. Bonds have a life of five to fifteen years and likewise are issued every two months.

   Both financing instruments are sold via the Dutch auction system. There are two types of bids: investors can enter a competitive bid, specifying the price and the volume, or a non-competitive bid, specifying only the volume.

   Most often, the performance of a long-term government bond series is measured by the yield or internal rate of return[3]. This is an ex-ante measure and as such is useless for studying historical returns. In order to provide an ex-post measure of returns, the Bank of Spain constructed a long-term government debt index reflecting the behavior of those outstanding issues which enjoy the highest turnover in the market, i.e. those considered to be highly liquid, either because they are quoted at least seven days per month or because there are at least ten transactions in that particular issue per month.

   This index was used from January 1988 to December 1990 to calculate total returns, i.e. capital appreciation plus accrued interest.

2. *Treasury bills.* In 1987, Treasury bills were introduced as a substitute for "*Pagarés del Tesoro*". They have a face value of 1,000,000 pesetas, are issued at a discount, and their time to maturity is no longer than eighteen months. They have a privileged tax treatment as they are exempted from paying the 25% withholding tax normally levied on interest payments. Since their first issue, Treasury bills have grown considerably, doubling their volume between 1987 and 1989.

D. Corporate Bonds (1988-1990)

The Spanish market for corporate bonds was highly regulated in the past, resulting in a very narrow secondary market. A few sectors account for more than 70% of the quoted private companies in the Madrid Stock Exchange, mainly electric utilities, road builders and Telefónica.

Both notes and bonds are normally issued in bearer form at par value, with semiannual or annual interest payments. The coupon may be either fixed for the whole life of the bond or fixed only for a part of it and variable for the rest.

Corporate bonds may be issued at par, at a discount, or at a premium. They are traded in organized markets such as the Madrid Stock Exchange or the "Asociación de Intermediarios de Activos Financieros" (AIAF).

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[3] The internal rate of return is the rate of return that equates the bond's price with the stream of cash flows promised to the bondholder.

The price of a bond is determined by the present value of the discounted future cash flows, where the discount rate is the rate required by the market for alternative investments having the same horizon and risk.

To obtain a series of ex-post corporate bond returns we constructed an index which reflects the performance of a value-weighted portfolio. It was difficult to obtain corporate returns for all bonds outstanding because of the lack of liquidity in the secondary market. Our index, therefore, includes only those corporate bonds quoted more than 60% of the days in the year. Between 1988 and 1990 there were five companies which fulfilled these criteria. They were all in the electricity sector, had a maturity of three years or longer, and enjoyed a tax exemption of 95% on the 25% withholding tax.

E. Inflation

Inflation has been measured by using the non seasonally adjusted consumer price index (CPI).

Component returns

Following the procedure established by Ibbotson and Sinquefield for U.S. data, and later by Hamao for Japanese data, it is possible to derive separate components of the returns studied so far.

$$\text{A. Bond horizon premium} = \frac{1 + \text{return on LGB}}{1 + \text{return on TBI}} - 1$$

This premium reflects the net return from investing in long-term government debt rather than Treasury bills. It is also known as the liquidity or maturity premium and can be thought of as the gains and/or losses resulting from a decision to hold long-term bonds rather than short-term bonds.

$$\text{B. Bond default premium} = \frac{1 + \text{return on CBI}}{1 + \text{return on LGB}} - 1$$

Corporate bonds are riskier than government bonds since they are not backed by the government. This is commonly known as "credit risk".

The difference between the returns on corporate bonds and long-term government bonds is the bond default premium.

$$\text{C. Equity risk premium} = \frac{1 + \text{return on MSE}}{1 + \text{return on TBI}} - 1$$

The return on stocks in excess of the return on short-term bonds is called the equity risk premium. Because stocks are generally riskier than fixed income instruments we would expect the return on stocks to exceed that on bonds.

$$\text{D. Inflation adjusted index} = \frac{W(T)}{CPI} * 100$$

Tables 2.A, 2.B and 2.C present summary statistics.

Table 2.A
Monthly total returns on long-term government debt, treasury bills,
and bond horizon premium, 1988-1990
Statistical summary

	Arithmetic mean	Geometric mean	Standard deviation
Long-term government debt	0.950%	0.947%	0.764%
Treasury bills	1.008%	1.008%	0.107%
Bond horizon premium	-0.058%	-0.060%	0.756%

Table 2.B
Monthly total returns on corporate fixed income, long-term government debt
and bond default premium, 1988-1990
Statistical summary

	Arithmetic mean	Geometric mean	Standard deviation
Long-term government debt	0.950%	0.947%	0.764%
Corporate bonds	0.980%	0.977%	0.790%
Bond default premium	0.034%	0.029%	1.014%

Table 2.C
Monthly total returns on common stock and treasury bills,
equity risk premium, 1988-1990
Statistical summary

	Arithmetic mean	Geometric mean	Standard deviation
Common stocks	0.384%	0.194%	6.182%
Treasury bills	1.008%	1.008%	0.107%
Equity risk premium	-0.617%	-0.806%	6.139%

Historical highlights of the returns

A. Common stocks (1941-1990)

Returns on financial assets normally follow the rule that "the higher the risk, the higher the return". Over the period 1988 to 1990, common stocks exhibited high volatility. Furthermore, contrary to what was expected, common stocks ended the period actually offering a lower return than other assets, i.e. the equity risk premium turned out to be negative. This can be explained by the terrible results of stocks in 1990. If we excluded 1990 from the series, the equity risk premium would be positive. From these results we

conclude that the period 1988-1990 is too short to draw firm conclusions about the size or direction of the equity risk premium.

Some highlights of Spanish common stock returns are:

1. The total annual average return for the Spanish stock market was 12.1%. Excluding dividends, stocks returned 7.5% per year. Once adjusted for inflation, the normal index in 1990 turned out to be 46.2. Therefore, of every 100 pesetas invested in 1940 there were only 46.2 pesetas of equal purchasing power left in 1990. Thus, all of the positive benefits came from dividends.

   The total inflation adjusted index (including dividends) in 1990 was 360.8, so in reality there was a positive 2.6% annual real return for the fifty-year period.

2. Over the period 1941 to 1990, the arithmetic and geometric mean of the annual returns for stocks were 14.872% and 12.06%, respectively, and 5.439% and 2.6% for inflation adjusted stock returns.

   The arithmetic and geometric means of monthly returns were 1.077% and 0.933%, respectively. Adjusting for inflation, the returns were 0.34% and 0.214%. Common stocks' volatility was very high; monthly returns had a standard deviation of 4.993%, while annual returns had a standard deviation of 26.668% (see Table 3).

Table 3.
Monthly and annual returns of the total MSE index.
1941-1990 and 1988-1990
Statistical summary

	Arithmetic mean	Geometric mean	Standard deviation	Autocor-relation
Period: 1941-1990				
nominal monthly return	1.077%	0.953%	4.992%	0.153
infl. adj. monthly return	0.340%	0.214%	5.003%	0.176
nominal annual return	14.872%	12.060%	26.668%	0.251
infl. adj. annual return	5.439%	2.6000%	25.292%	0.360
Period: 1988-1990				
nominal monthly return	0.384%	0.194%	6.182%	0.047
infl. adj. monthly return	-0.135%	-0.327%	6.208%	0.002
nominal annual return	4.331%	2.358%	*	*
infl. adj. annual return	-1.948%	-3.855%	*	*

(*) N.A. due to the available data.

Table 4. Annual total returns in stocks for different investment horizons (1941-1990)

	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1941	38.93																																																	
1942	22.69	8.34																																																
1943	8.48	-4.14	-15.18																																															
1944	11.91	4.12	2.07	22.84																																														
1945	10.99	4.93	3.82	14.86	7.40																																													
1946	18.35	14.61	16.23	29.10	32.36	63.11																																												
1947	17.23	13.96	15.12	24.25	24.72	34.40	10.75																																											
1948	10.37	6.80	6.54	11.51	8.85	9.33	-10.49	-27.05																																										
1949	8.35	5.03	4.57	8.28	5.59	5.14	-9.18	-17.78	-6.51																																									
1950	8.60	6.87	5.34	8.65	6.45	6.26	-4.54	-9.15	1.81	10.86																																								
1951	9.45	6.87	6.71	9.82	8.07	8.19	-0.34	-2.94	7.06	14.55	18.37																																							
1952	9.26	6.92	6.78	9.54	7.89	8.07	0.90	-0.96	7.13	12.11	12.74	7.37																																						
1953	9.38	7.12	7.22	9.65	8.28	8.39	2.24	0.88	7.82	11.73	12.03	8.98	10.62																																					
1954	10.87	8.96	9.01	11.53	10.46	10.80	5.57	4.85	11.54	15.55	16.76	16.22	20.92	32.18																																				
1955	12.91	11.57	11.83	14.43	13.70	14.35	9.92	9.82	16.56	20.93	23.06	25.25	30.45	41.66	51.81																																			
1956	11.85	10.43	10.56	12.53	11.83	12.18	8.74	8.55	13.05	15.46	16.05	15.72	17.18	18.53	15.35	-8.28																																		
1957	10.60	9.21	9.26	11.00	10.26	10.46	7.20	6.91	10.77	12.67	12.87	12.20	12.91	13.30	9.56	1.32	-8.72																																	
1958	10.54	9.22	9.27	10.81	10.20	10.39	7.36	7.10	10.66	12.37	12.52	11.89	12.46	12.73	9.78	2.89	-4.50	-0.57																																
1959	11.72	10.56	10.62	11.94	11.45	11.68	9.06	9.12	12.15	13.62	13.83	13.46	14.04	14.38	12.56	8.05	6.78	10.92	13.01																															
1960	12.06	10.92	11.05	12.09	11.67	11.94	9.73	9.03	13.38	13.21	13.38	13.00	13.49	13.75	12.05	8.34	5.05	9.22	9.91	1.75																														
1961	11.36	10.30	10.39	11.78	11.25	11.46	9.14	9.03	11.86	13.21	13.38	13.00	13.75	14.04	14.17	9.62	5.42	9.22	9.91	4.30	38.04																													
1962	11.34	10.32	10.41	11.74	11.24	11.43	9.22	9.14	11.81	13.06	13.29	12.85	13.29	13.51	11.95	8.59	5.69	8.09	10.06	3.73	28.45	19.52																												
1963	11.18	10.27	10.19	11.53	11.05	11.22	9.11	9.03	11.54	12.70	12.82	12.46	12.83	13.01	11.54	8.46	5.83	7.98	9.68	2.76	18.34	9.57	0.44																											
1964	10.92	9.96	10.03	11.23	10.75	10.90	8.89	8.79	11.15	12.23	12.31	11.94	12.25	12.37	10.97	8.11	5.70	7.62	9.09	1.68	12.01	8.18	6.04	7.61																										
1965	11.73	10.84	10.93	12.13	11.70	11.90	10.00	9.96	12.29	13.37	13.51	13.24	13.61	13.81	12.60	10.05	7.95	9.94	11.53	4.16	14.77	11.79	10.55	13.99	10.93																										
1966	10.84	10.03	10.05	11.43	11.00	11.67	9.22	9.14	11.86	13.02	13.18	13.81	14.18	14.39	13.39	13.31	11.04	13.18	14.96	7.76	16.52	13.99	15.09	18.93	21.33	24.06																									
1967	13.02	12.34	12.44	13.56	13.20	13.45	11.67	11.71	14.05	15.19	15.42	15.28	15.74	16.07	15.07	12.81	15.07	14.18	4.42								4.42																							
1968	12.19	11.37	11.48	12.61	12.43	12.66	10.71	10.70	12.86	13.88	14.03	13.81	14.18	14.39	13.36	11.18	9.44	11.26	12.71	4.99	15.57	13.31	12.56	14.41	21.33	16.53	30.32	45.59																							
1969	12.39	11.60	11.72	12.82	12.47	12.66	11.01	11.02	13.11	14.09	14.25	14.04	14.41	14.62	13.66	11.63	10.03	11.77	13.15	5.29	14.84	13.83	13.21	14.92	16.00	16.87	18.93	22.86	18.74																					
1970	13.05	12.30	12.43	13.53	13.21	13.43	11.86	11.90	13.96	14.94	15.13	14.98	15.37	15.63	14.77	12.90	11.46	13.21	14.61	6.72	17.35	15.64	15.25	17.03	18.26	19.35	21.52	25.27	22.69	26.70	35.38																			
1971	12.45	11.73	11.84	12.84	12.52	12.70	11.23	11.24	13.10	13.96	14.10	13.91	14.22	14.39	13.57	11.85	10.52	11.99	13.13	4.84	15.24	13.65	13.17	14.40	15.11	15.58	16.69	18.55	16.69	14.01	23.06	25.38																		
1972	12.30	11.60	11.70	12.66	12.35	12.52	11.10	11.10	12.88	13.70	13.81	13.63	13.91	14.06	13.26	11.61	10.35	11.72	12.77	4.34	14.68	13.17	12.70	13.79	14.37	14.72	15.59	17.07	15.86	8.87	12.93	11.56	16.11																		
1973	10.97	10.31	10.26	11.20	10.85	10.98	9.55	9.51	11.14	11.85	11.89	11.64	11.82	11.87	11.03	9.39	8.10	9.26	10.09	1.38	11.50	9.93	9.27	9.96	10.18	10.12	10.42	11.11	8.33	2.85	5.04	2.52	3.30	-6.09																	
1974	10.26	9.53	9.60	10.31	9.80	9.46	8.06	7.97	9.47	10.09	10.06	9.75	9.85	9.82	8.94	7.31	6.01	6.98	7.63	-1.69	8.64	7.03	6.24	6.67	6.60	6.24	6.17	6.34	3.46	-1.69	-0.55	-3.42	4.59	-0.73	-4.36	-10.35															
1975	9.66	8.96	8.41	9.09	8.75	8.79	7.57	7.48	8.74	9.24	9.19	8.90	8.95	8.90	8.15	6.80	5.73	6.50	6.99	-1.01	7.71	6.44	5.83	6.12	6.03	5.75	5.67	5.75	3.86	0.68	1.63	0.14	3.30	-2.83	-4.74	-11.45	-26.87														
1976	9.25	8.58	8.92	9.61	9.31	9.36	8.12	8.09	9.11	9.90	9.87	9.60	9.68	9.64	8.88	7.51	6.42	7.25	7.80	-0.14	8.64	7.34	6.74	7.10	7.07	6.83	6.81	6.99	5.02	2.80	2.69	1.23	3.50	-4.05	-5.12	-8.79	-11.69	-7.42													
1977	8.77	8.07	8.07	8.80	8.45	8.45	7.12	7.01	8.37	8.90	8.83	8.51	8.55	8.47	7.62	6.09	4.86	5.68	6.20	-2.02	6.94	5.44	4.66	4.93	4.76	4.33	4.12	4.09	1.59	-2.66	-1.89	-4.19	0.83	-8.69	-8.80	-13.23	-17.71	-14.41	-6.45												
1978	8.97	8.30	8.30	9.01	8.65	8.69	7.40	7.30	8.63	9.16	9.10	8.79	8.78	8.78	7.97	6.51	5.34	6.15	6.68	-1.14	7.43	6.02	5.32	5.61	5.49	5.14	5.00	5.04	2.80	-1.01	-0.14	-2.02	0.83	-3.69	-1.60	-4.28	-20.44	-17.02	-8.92	17.13											
1979	9.56	8.91	8.93	9.65	9.31	9.36	8.12	8.05	9.37	9.90	9.87	9.60	9.68	9.64	8.89	7.51	6.42	7.25	7.80	0.83	8.64	7.34	6.74	7.10	7.07	6.83	6.81	6.99	5.02	1.63	2.69	1.23	3.29	-1.99	-3.45	-8.62	-11.69	-7.42	3.29	17.13	35.78										
1980	9.05	8.40	8.41	9.09	8.75	8.79	7.48	7.48	8.74	9.24	9.19	8.90	8.95	8.90	8.15	6.80	5.73	6.50	6.99	0.14	7.71	6.44	5.83	6.12	6.03	5.75	5.67	5.75	3.86	0.68	2.69	1.23	3.50	-2.83	-5.85	-5.12	8.62	13.15	26.11	10.49	-10.09										
1981	9.53	8.92	8.91	9.61	9.29	9.34	8.09	8.05	9.34	9.90	9.87	9.60	9.68	9.64	8.90	7.51	6.42	7.25	7.78	0.68	7.71	6.44	5.83	6.12	6.03	5.67	5.67	5.75	3.86	1.63	4.59	0.14	6.83	-4.05	-5.85	-1.80	4.59	8.69	13.15	26.11	10.49	-10.09								
1982	10.36	9.77	9.80	10.50	10.21	10.28	9.11	9.11	10.36	10.88	10.88	10.66	10.77	10.77	10.12	8.91	7.98	8.65	9.34	2.63	10.21	9.14	8.69	9.09	9.17	9.08	9.19	9.48	8.00	5.39	6.53	5.66	8.69	2.42	3.14	7.67	14.11	17.38	20.79	34.07	41.90	52.83	31.75							
1983	11.00	10.43	10.48	11.18	10.91	11.00	9.89	9.85	11.13	11.67	11.69	11.50	11.63	11.66	11.06	9.90	9.03	9.85	10.43	11.29	11.36	10.37	9.99	10.45	10.58	10.57	10.75	11.11	9.80	7.42	8.65	7.97	11.12	5.31	6.63	6.57	17.38	25.61	26.61	36.64	40.19	47.86	43.06							
1984	12.61	12.09	12.18	12.91	12.68	12.81	11.78	11.81	13.09	13.68	13.76	13.63	13.82	13.92	13.41	12.32	11.54	12.44	13.11	14.05	14.24	13.38	13.13	13.71	14.00	14.15	14.51	15.07	14.00	11.93	13.41	13.07	17.63	11.29	13.08	13.63	25.61	34.07	36.64	40.19	57.92	67.75	75.75	115.90						
1985	12.95	12.46	12.55	13.26	13.05	13.18	12.19	12.24	13.48	14.14	14.23	14.01	14.20	14.02	13.82	12.48	11.72	12.60	13.25	14.17	14.35	13.53	13.29	13.86	14.14	14.29	14.64	15.18	14.17	12.22	13.64	13.00	18.62	11.72	13.94	13.94	24.76	28.43	34.07	36.83	48.82	53.42	53.61	59.18	17.36					
1986	12.46	12.18	12.29	13.01	12.79	12.92	12.00	12.24	13.20	13.77	13.85	13.73	13.92	14.02	13.51	12.83	12.11	12.60	13.62	14.52	14.71	13.92	13.71	14.28	14.72	14.72	15.08	15.62	14.68	12.85	14.23	13.98	19.12	12.54	14.73	14.73	28.05	32.99	35.12	35.03	47.19	48.82	44.50	46.74	45.81	24.71				
1987	12.41	12.09	12.20	12.91	12.70	12.92	11.94	12.19	13.20	13.95	14.03	13.92	14.10	14.20	13.72	13.02	12.06	12.89	13.51	14.38	14.55	13.79	13.59	14.13	14.54	14.54	15.37	15.37	14.47	12.72	14.02	13.77	18.42	12.40	13.92	14.42	23.49	31.67	30.54	32.12	40.30	39.04	40.30	37.92	36.66	34.71	17.34			
1988	12.06	11.72	11.84	12.50	12.29	12.55	11.70	11.94	12.81	13.40	13.40	13.26	13.44	13.51	13.03	12.37	11.63	12.07	13.08	13.89	14.08	13.30	13.13	13.67	14.11	14.11	14.47	15.01	14.07	12.24	13.62	13.37	18.48	11.90	14.12	14.12	27.60	31.81	34.58	34.58	46.82	51.32	49.48	51.68	50.73	30.88	37.14	43.27		
1989	12.06	11.64	12.18	12.30	12.06	13.12	12.16	12.19	13.40	13.95	14.03	13.92	14.10	14.20	13.72	13.02	12.06	12.89	13.51	14.38	14.55	13.79	13.59	14.13	14.54	14.54	15.37	15.37	14.47	12.49	14.02	14.93	19.19	12.40	13.92	11.52	25.32	24.21	29.33	28.99	40.30	37.92	39.04	40.30	45.81	36.66	17.34	17.33	10.38	
1990	12.06	11.57	11.64	12.30	12.06	12.81	11.85	11.53	12.39	12.95	12.81	12.96	12.96	13.02	12.53	11.57	10.86	11.63	12.19	12.97	13.09	12.32	12.07	12.52	12.79	12.79	13.03	13.42	12.49	10.76	11.87	11.53	16.34	10.00	11.25	11.52	24.55	25.32	24.21	29.33	30.54	25.39	28.99	29.33	25.39	22.13	5.92	2.36	-7.27	-22.09

3. The averages just referred to are for the period as a whole. We also compute geometric mean annual returns, R_G (T1, T2), for any calendar holding period, beginning with year T_1 and ending with year T_2, according to the formula:

$$R_G^* (T_1 T_2) = \left[\prod_{T=T_1}^{T_2} (1 + RT) \right]^{1/(T_2-T_1+1)} - 1$$

Examining all possible holding periods within the fifty years (see Table 4), we found the maximum loss to have been in 1977 (28.34%), and the maximum gain in 1986 (115.90%). The arithmetic mean of all the other possibilities was 14.87% and the standard deviation, 26.67%.

4. Looking solely at the period from 1988 to 1990, indices of both real price return and real total return declined. The inflation adjusted total return was -3.855% per year (Table 3) and the volatility of monthly returns was higher between 1988 and 1990 than between 1941 and 1990.

   The autocorrelation index of the MSE for the period 1941 to 1990 was 0.153. Given the t-statistic (3.791), we must reject the null hypothesis, with a 95% confidence interval, that the autocorrelations are zero, suggesting that the market was not efficient. This result contrasts with the efficiency demonstrated by the Spanish market in the final three years (see Table 3).

B. Government debt (1988-1990)

Some highlights of Spanish government debt returns are:

1. Over the period 1988-1990, the total average annual return was 11.98%, stemming mainly from income return rather than capital appreciation.

   The inflation adjusted index shows that 100 pesetas invested in December 1987 grew to 116.4 pesetas of the same purchasing power in December 1990, so the real return on the investment was 16.4%, or 5.18% per year on average. Throughout the period, the return on the debt was always higher than the inflation rate, i.e. the inflation adjusted index never fell below 100.

2. The arithmetic mean of the nominal and real monthly returns are 0.95% and 0.43%, respectively. These series are far less volatile than the common stock series for the same period.

3. The short-term government debt index, i.e. the Treasury bills index (TBI), with base 100 in December 1987, reached 143.5 in December 1990 in nominal terms, averaging an annual return of 12.8% (see Table 5). In real terms, it reached only 118.9, with an annual average real return of 5.94%.

   During the same period, the nominal monthly results were relatively stable, with an arithmetic mean of 1.01%, a geometric mean of 1.008%, and a standard deviation of 0.107%. Taking inflation into account, the real returns show an arithmetic mean of 0.48% and a relatively higher standard deviation, 0.47%, due to changes in inflation rates over the period.

4. The TBI and LGB indices in December 1990 were 143 and 140.4, respectively, i.e. there was a negative bond horizon premium (see Table 5). The period 1988-1990 is too short to draw significant conclusions. However, if in the future the TBI remains higher than the LM, we can safely say that more investors are averse to the reinvestment risk of bills than to the price fluctuation risk of long bonds. The relatively low volume for long-term bonds in the Spanish market and the economic policies of the Bank of Spain explain that investors who could have invested in long-term securities actually invested in short-term ones. LGB had a higher volatility than TBI, namely 0.764% vs. 0.107%. This is consistent with the fact that, under a similar change in interest rates, it will be the securities with a longer time to maturity that will show a greater fluctuation in prices.

C. Corporate bonds (1988-1990)

Some highlights of medium-term corporate bonds' annual returns are:

1. Over the period 1988-1990, the total annual average return was 12.4%. The total index in December 1990 reached 141.9, of which 46.5 represented income return and -3.2 represented capital depreciation;

2. Bond default premium turned out to be positive, as the indices for corporate bonds and long-term government debt were 141.9 and 140.4, respectively (see Table 5). The inflation adjusted index for December 1990 was 117.6, i.e. a real annual average return of 5.6%.

Table 5.
Total Return Index Values. Common stocks, corporate bonds,
long-term government debt and Treasury bills,
1988-1990. December 1987=100

Date	MSE	CBI	LGB	TBI
D 1987	100.000	100.000	100.000	100.000
J 1988	109.199	101.060	102.131	100.917
F	111.593	104.031	103.134	101.842
M	118.579	105.674	106.392	102.716
A	120.706	107.639	106.182	103.538
M	125.338	108.328	108.523	104.392
J	132.618	109.029	109.046	105.262
J	131.886	111.684	109.663	106.148
A	126.858	112.707	110.945	107.015
S	126.445	111.743	110.143	107.906
0	130.889	113.175	110.739	108.922
N	127.332	113.088	111.916	109.930
D	124.705	113.997	111.458	110.974
J 1989	128.930	114.726	112.322	112.084
F	123.027	115.464	113.369	113.224
M	129.424	114.809	113.775	114.356
A	136.259	117.412	114.717	115.537
M	143.376	118.613	115.850	116.780
J	144.663	119.493	117.271	118.054
J	144.905	121.117	118.491	119.323
A	147.136	122.622	119.887	120.606

Table 5 (continued)

Date	MSE	CBI	LGB	TBI
S	149.888	123.728	121.014	121.883
O	142.269	123.542	122.142	123.142
N	140.684	125.397	122.614	124.476
D	137.650	126.847	122.781	125.835
J 1990	131.264	127.560	125.248	127.230
F	128.186	129.988	125.358	128.619
M	120.927	130.003	126.821	130.055
A	140.131	130.987	128.374	131.485
M	134.617	132.558	130.061	132.899
J	140.187	134.410	131.560	134.350
J	139.804	135.479	133.119	135.783
A	122.688	136.650	134.049	137.265
S	99.914	136.658	134.222	138.775
O	111.095	138.104	137.101	140.313
N	109.901	139.498	138.853	141.903
D	107.242	141.907	140.413	143.500

Monthly returns for the period 1988-1990 showed an arithmetic mean of 0.98% and a standard deviation of 0.79%. Inflation adjusted returns showed a greater volatility than nominal returns, namely 0.95%.

D. Inter-country comparisons

In order to facilitate comparisons with U.S. and Japanese data, asset returns were translated into series starting in December 1970. The comparisons were done using each country's own currency and also in a common currency, namely U.S. dollars. In the case of Spain, the conversion was done using the spot peseta/U.S. dollar rate at the end of each month. See Notations and Definitions.

1. In U.S. dollar terms, the performance of the MSE was similar to that of the New York Stock Exchange, with an annual average return of 10.7% and 10.6%, respectively. The Tokyo Stock Exchange averaged an annual return of 25.2% (see Table 6).

Table 6.
Stock market indices in national currencies and in U.S. dollars.
Madrid, New York and Tokyo stock exchanges

Year	MSE	TSE	S&P 500	MSE in $	TSE in $
1970	100.00	100.00	100.00	100.00	100.00
1971	118.57	139.36	114.31	125.27	158.01
1972	160.52	287.88	136.00	176.03	340.65
1973	186.38	224.06	116.06	228.27	286.44
1974	171.31	209.12	85.34	212.53	249.02
1975	183.66	248.52	117.10	213.88	291.52
1976	134.32	301.39	145.02	136.92	369.02
1977	96.25	291.98	134.60	82.82	435.38
1978	92.47	367.25	143.43	91.85	676.22
1979	84.22	383.29	169.87	88.64	571.66
1980	98.65	419.42	224.95	86.65	718.67
1981	133.95	493.90	213.90	95.68	803.24
1982	120.43	524.28	259.70	66.75	796.04
1983	158.67	657.58	318.17	70.47	1,012.61
1984	242.50	831.91	338.11	97.31	1,185.15
1985	346.93	967.69	446.83	156.63	1,728.90
1986	749.00	1,447.54	529.37	393.73	3,226.32
1987	879.03	1,578.25	557.06	561.26	4,591.10

2. For the period 1971 to 1987, the U.S. and Japanese markets show less volatility than the Spanish market. New York and Tokyo's indices in U.S. dollars have a standard deviation of 4.75% and 5.73%, respectively, while Madrid's is 6.97% (see Table 7). Using volatility as a measure of risk, we can conclude that the Madrid Stock Exchange is riskier than the other two.

3. With regard to market efficiency, we find that for Tokyo and New York we cannot reject the hypothesis that the true autocorrelations are zero, thus suggesting that the markets were efficient. As already mentioned, the Spanish market was inefficient for the period 1940 to 1990; however, its efficiency has increased considerably in the last few years.

Summary statistics for monthly returns on common stocks and U.S. and Japanese data for the same period are shown in Table 7. Autocorrelations are shown in Table 8. The information on the U.S. and Japan has been taken from Hamao (1991). The Tokyo Stock Exchange index includes only companies which meet very stringent conditions on liquidity, times quoted per year and dividends. This is known as the TSE-I, which included 1,100 companies at year-end 1987. The information on the U.S. market was taken by Hamao (1991) from Ibbotson Associates (1988). The index used was the Standard & Poor's 500.

Table 7.
Investment in Common Stocks in Spain, U.S. and Japan,
1971-1987: Monthly returns
Comparison of basic statistical data
(in %)

	Mean		Standard deviation
	Arithmetic	Geometric	
Total returns			
MSE index	1,26	1,07	6,15
MSE index in U.S. dollars	1,09	0,85	6,97
TSE index	1,46	1,36	4,38
TSE index in U.S. dollars	2,05	1,89	5,76
S&P 500 index	0,96	0,85	4,75
Capital appreciation in dollars			
MSE index	0,77	0,59	6,10
TSE index	1,30	1,20	4,36
S&P 500 index	0,60	0,48	4,76
Income in dollars			
MSE index	0,49	0,48	0,74
TSE index	0,16	0,16	0,28
S&P 500 index	0,36	0,36	0,24

Table 8.
Investment in Common Stock in Spain, U.S.A. and Japan,
1971-1987: Autocorrelation Indices of monthly returns

	Autocorrelation index	t statistic
Madrid	0.245	3.588
Tokyo	0.111	1.572
New York	0.019	0.269

Conclusion

In this study, we collected and assembled data series to analyze the performance of Spanish capital markets. We used information provided by the Madrid Stock Exchange and the Bank of Spain, and prepared the first published index for medium-term corporate bonds.

These series provided a deeper knowledge of the Spanish capital markets and allowed comparison with New York and Tokyo from 1971 to 1987.

One of the contributions of our study is to help academics and practitioners in their respective fields. Studies of this kind are a major tool in an era of ever-increasing market globalization.

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